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December 24, 1931

Engineering News-Record

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A New Christmas

Christmas candlelight is shining out on the winter landscape. It is not universally a bright landscape this year but there is something to cheer gloomy spirits, for not since the days when the desolation of war brought sorrow and need to many homes has there been such an expression of the desire to share with one another as we have been witnessing in recent months.

✦ Adversity is not wholly without benefit: it helps us to distinguish between the superficial and the fundamental things of life. No man liveth unto himself!—this truth was never more clear than in days like the present.

✦ This recognition of the fundamental community of men and its visible expressions found on all sides offer reason for rejoicing. In few homes will Christmas this year be a carefree festival; but so long as those who have are inspired to share with their less-fortunate neighbors we may go into the Christmas season and into the coming New Year with firm trust in men and in our future.

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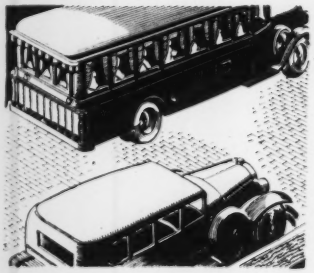
FOLLOWING A FUNDAMENTAL POLICY—TO MEET THE DEMANDS OF PRESENT AND FUTURE TRAFFIC

The William Penn Highway—U. S. Route 22—Fourteen miles of Brick Pavement laid in 1929

BETTER than any other material, Modern Brick Construction meets the demands of present and future traffic. That is why — in line with its fundamental policy of building for the future, the Pennsylvania Department of Highways selected brick for the William Penn Highway on U. S. Route 22, extending fourteen miles from the West Virginia State line toward Pittsburgh.



Tapping the highways of three great commonwealths, this "Steubenville Pike" (as it is locally known) demonstrates the adaptability of brick to modern paving requirements —in terms of beauty, smoothness, durability and economy.

There are seven major relocations on this project, totaling almost 7 miles in length and shortening the travel distance by 1718 feet. Note the realignments in the above view showing new and old bridges. The beautiful appearance of this Vitrified Brick Pavement was enhanced by the fine finish given to the shoulders and slopes. It is further enhanced to the motorist by the smoothness of its surface and to the tax payer by its guarantee of long-life and freedom from repairs.

THE METROPOLITAN PAVING BRICK CO.
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BRICK PAVEMENTS

ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL OF CIVIL ENGINEERING AND CONSTRUCTION PRACTICE

Volume 107 ✦ Established 1874 ✦ McGraw-Hill Publishing Company, Inc. ✦ Number 26

F. E. Schmitt, Editor

DECEMBER 24, 1931

Christmas, 1931

CHRISTMAS with its old magic is here, and *Engineering News-Record* extends warm greetings to its friends. It knows that many are burdened with trouble, that in company with other workers thousands of engineers have lost their livelihood. Yet there are a few things to bring some comfort. Engineers have learned to stand together. Adversity has brought them a spirit of common welfare to which they have been strangers. Never was there such whole-hearted laboring on the part of the more fortunate to aid and sustain their colleagues. This inspires hope that brotherhood among engineers may grow further. In other circles, too, the desire to cooperate has become strong. A consciousness of human relationship and mutual obligation has come into being that was not known before. Industries have learned to see their interdependence. The partnership of worker and management has taken hold of men's minds in remarkable degree, so that assurance of employment has come to be a chief subject of business thinking. In all respects industrial as well as social thought is advancing, good preparation for the coming time of restored faith and activity. Thus we are not without some motive for rejoicing in an otherwise sober and for many of us gloomy year-end.

Significant Commendation

ONCE again have Six Companies and the Bureau of Reclamation been commended for the way in which they met conditions and handled their construction forces at Hoover Dam, both now and during the highly trying period at the start of the huge project. A public information committee of three consulting engineers and three contractors declares, after a study and examination of the work, that there are no grounds for criticism of the conditions affecting labor. This confirms the opinion expressed in these columns several weeks ago. In a preliminary report the committee points out that, despite the rush to get started during a summer of unprecedented heat in order to furnish employment as quickly as possible, living facilities kept pace with the need, and that today these facilities are of unusually high character. Wages are declared to be fair, safety work thorough, and handling of employment satisfactory. In short, nothing but praise is accorded the engineers and contractors for dealing with a difficult situation. The finding, coming from competent and disinterested outsiders, is a final and complete rebuttal of the charges made by labor organization representatives some months ago. In addition it is a just source of pride in the splendid work of the engineering and construction organizations that are directing the highly responsible undertaking. What they have accomplished in their first half-year is effective assurance that the work will be successful throughout.

Practical Safety Education

INSTRUCTION through a special safety course for construction foremen, as scheduled for Newark, N. J., the next two months, is a practical and direct way of fighting the mounting toll of accidents in construction. In the unceasing war against these accidents safety laws, codes, slogans and posters are but secondary measures. The most powerful weapon is education. The management must accept the safety idea and the worker must eventually be reached, but the education of the foreman is a most important and direct step in accident elimination. The foreman, because of his constant presence at the actual scene of operations and his personal contact with every man in his crew, becomes the key man in any safety program. Therefore the combined action of the Associated Contractors of New Jersey and the Newark Safety Council in establishing a safety school especially for foremen is a front-line attack on the problem. The practical benefits coming from its series of seven well-planned and interesting sessions will be limited only by the attendance. Similar groups in other sections of the country, if really interested in the promotion of construction safety, would do well to adopt the Newark method.

It Can Be Done

AT A TIME when toll bridge and tunnel revenue is discussed in whispers if at all, the announcement that one of the larger new structures is exceeding its estimated earnings is important. The new member of the élite is the interstate bridge across Lake Champlain. Estimated to gross $90,500 from its opening in August, 1929, to June, 1931, it actually earned more than $127,000. This result is not due to chance but can be traced back to simple facts. Before the bridge was started its necessity was widely recognized, so that the estimated potential traffic actually appeared and used the bridge. A conservative view was taken of the proportion of existing ferry traffic that could be diverted to the bridge. The toll rate was set lower than the competitive ferry rate; usualiy it is made higher, on the view that a motorist will choose the bridge regardless of toll rate. Finally, fixed annual charges are less than $50,000 on this $1,150,000 project, a fact that augurs well for the continued success of the bridge. The Lake Champlain bridge is not alone in its good record, for

besides the Camden bridge and the Holland tunnel some other enterprises in various parts of the country are justifying the hopes of their planners. But success stories make good reading, and often they contain a useful moral.

Frank Discussion

EVERY example of a water controversy settled by mutual agreement adds to the evidence against the advisability of invoking the law to solve these questions except as a last resort. Years of wasted effort, wasted water, and money wasted in legal fees with results that satisfy neither party—these are the usual outcome of litigation over water. In sharp contrast are the results of a meeting where leaders of the opposing parties sit together in the solution of a common problem for the greatest advantage to all concerned, where they outline their programs and view with open mind the points of the other side, where sound engineering advice is listened to as a fundamental basis for solution and where the voice of the lawyer is stilled. The outcome of such negotiations in nearly every case is common understanding, and often a workable plan based on joint and cooperative use of the supply and facilities to the advantage of both sides. An example is the recent solution of an old controversy between San Diego and an irrigation district on the San Diego River. During years of litigation, water of immense value to both parties ran unused to the ocean. Finally leaders on both sides recognized the absurdity of the situation and arranged a meeting. The differences were soon settled, advantageously to all. Litigation is to end and joint operations are to be conducted to obtain the highest possible beneficial use of the water supply. Thus, fair agreement has once more proved its superiority over contention in the law courts.

Businesslike Policy

FOR YEARS without number the story of Western reclamation development has been marked by discussions between land-owners and government over their annual repayment installments on the cost of the irrigation works built for them from national funds. Pleas for postponement or cancellation of repayments were frequent. In order to end these demands by one single act of largess, Congress five years ago wrote off more than twenty-five million dollars of the project debts. There still were demands, however, and especially this year. Some weeks ago a strongly supported request was made that all repayments be deferred for three years, without interest. But a conference held at Washington within the past fortnight found a better solution, one based on wise policy. Members of Congress most directly concerned concluded, after study of the situation, that the three-year moratorium or any general postponement of payments would be bad; instead, they agreed, a bill should be passed permitting the individual farmer who cannot pay his 1932 construction charge to cover the amount by a five-year interest-bearing note. The businesslike nature of this procedure is gratifying evidence of a trend toward efficiency and soundness in public administration. The bill invites support and early passage. It maintains reclamation on a parity with other irrigation development and with farming enterprise elsewhere, as an activity able to stand on its own feet and balance its books.

Philadelphia's Municipal Plight

PHILADELPHIA, characterized in muck-raking days as "corrupt and contented," woke up early this month long enough to stage a mass demonstration against a proposed 20 per cent rise in its tax rate and a 50 per cent water rate increase. The city council speedily voted to abandon both, only to be confronted with the problem of what cuts to make in the 1932 budget to keep the tax rate at the 1931 figure and still make up deficits for this and previous years. While considering proposals for heavy cuts in next year's payrolls, the city was shocked by the news that there was no money available to pay nearly 20,000 city employees.

Chicago city employees are used to going without pay for weeks or months and lesser cities have made temporary postponements of pay to city employees of late, but it is said that for decades Philadelphia has met its payrolls when due. After a short delay and refusal of Philadelphia bankers to help out, a roundabout way was found to raise money for the city payroll, the city buying some of its own bonds found unsalable in the general bond market, using sinking fund money for the purpose.

Philadelphia's plight might be left to its own consideration did it not raise questions of countrywide application. One of these is: Are our city authorities going wild on expenditures and raising tax rates to unbearable heights? Broadly, the answer is, *No*. There may be exceptions, both as to cities and objects of expenditure, but as a rule our cities are underprovided with services properly renderable. This is notably true of municipal engineering works and services essential for health, comfort and convenience, and so recognized and demanded by citizens and taxpayers. Nor are tax rates in general too high. Where they are felt to be burdensome it is usually because of bad methods of municipal planning and financing.

Those who protest the loudest against increasing municipal expenditures and tax rates know the least about them—just how much they have increased in terms of purchasing power of the dollar, what services cities are now rendering that either were formerly provided by utility companies, private scavengers and the like, or were not formerly rendered at all but are now imperatively demanded for the protection of life and safety.

Chicago and Philadelphia are victims of misadministration rather than unwarranted services or excessive taxes. Doubtless there are extravagances and graft, but their elimination, desirable as it is, would not do as much to put these cities on a sound financial basis as would reforms in budgetmaking, taxation, salary grading, general administration and the adoption of long-time plans for public improvements and their financing. At Chicago much could be gained by wiping out overlapping governmental and taxing units in Cook County, but it may be noted that Philadelphia, where city and county are one, has financial maladministration in some respects worse than Chicago's.

Throughout the country, more rather than less public-works construction is needed. Payments for municipal services could be lowered or at least made more equitable and less burdensome by improved planning, better rate structures for municipal utility services, and other improvements known to those well informed on the subject but little known and less heeded by the city authorities. The root of the whole matter lies in the indifference and

blindness of citizens and taxpayers in selecting their public servants and seeing that they render honest and efficient service.

Urgent Relief Problems

NO ONE can be brought into close contact with unemployment relief work without realizing thoroughly its complexity and difficulty. Three major problems are involved, all equally baffling: finding jobs, inspiriting the unemployed men, and holding the interest of the men who must keep the relief organization going by contributions of time and money.

Recently this journal made a check to determine where relief work for engineers is being undertaken throughout the country, what special local conditions are encountered, and what methods are being found effective. The results, summarized in this week's news pages, throw light on some phases of the three problems mentioned.

First, work of purely engineering nature is hard to find in time of depression. Because engineering is primarily a function of expansion, of new construction and of development, it is earliest of all activities to be affected by contraction of business. Private concerns, hard pressed to keep going, can do little in the way of providing new jobs for engineers. Where relief committees have met with success it has been through obtaining engineering work connected with expanded public works or through placing engineers as foremen directing gangs of unemployed in general relief programs. Where engineer relief committees are able to sell the latter idea to the directors of general relief operations its success is assured, because of the resulting increase in gang efficiency and morale.

As to the second problem: combating lowered morale among the unemployed men themselves is a less tangible task, yet a very trying one. The relief committee from one city reports finding it "difficult to arouse the spirit of fight and cooperation among the unemployed. So many of them have always been on salaries that the loss of the regular pay check seems to have stunned them into inaction." Another city reports that an offer of work not directly in engineering on a commission basis found no takers. Possibly a period of depression tends to single out the men less able to shift for themselves, but if this be a fact it was not anticipated. It emphasizes the importance of morale-building. Not only is any lowering of morale a handicap to the men themselves, it handicaps also the relief work by deadening the enthusiasm of the committee officials.

Finally, stimulating and maintaining enthusiasm within the committee is itself a serious problem. A relief committee member must either occupy a position of prominence, in which he can establish direct personal contact with persons to whom the committee must appeal for work or funds, or he must be a persistent worker. Fortunate is the committee that finds several men combining both qualities. Relief work is slow and time-consuming; a few weeks of apparently unproductive work is apt to discourage many, especially those who take up the work half-heartedly. Too often the prominent men, upon whom the workers of the committees should be able to lean for help, turn out to be of that class which is irreverently spoken of as "stuffed shirts."

Fortunately there is a bright side to the picture. Hard, persistent work on the part of some committees is bringing results. In the New York district, for example, work of one kind or another has been found for more than three hundred, constituting over two-thirds of the total number of men in urgent need of help. The most optimistic of the committee had no hope of so much success when the work started. Thus, at a time when faith in engineering as a profession begins to ebb, hope is revived by the example of what engineers can do when they put their shoulders to the wheel. Effective work has been accomplished in the profession's relief work. But it is only a beginning and this is no time to rest on laurels. The winter has hardly begun; many of the jobs found are temporary. Other jobs must be found, and pressure must be maintained to keep jobs open for men already placed.

Money also is needed, part of it to be used as loans to engineers who cannot meet insurance premiums, taxes, and mortgage interest. Many of the workers who have carried on the fight until now have done so at the expense of their own work; they should be relieved. The challenge now is to those who have not yet put their hand to the wheel, or who, having put it there, have put no weight behind it.

Soil Research and Roadbuilding

DRAWING on his extensive acquaintance with developments in soil mechanics, Prof. D. P. Krynine in a discussion at the meeting of the Highway Research Board two weeks ago gave cogent reasons for the tardiness of highway builders in adopting soil surveys. He stated that the soil-profile schedules worked out by investigators at much pains of research and scientific reasoning are failures in practical application, first because they cannot be used unless the highway department has a strong organization of soil specialists, and second because construction engineers doubt the practical value of a design device that involves such a mass of data.

These statements deserve close attention by soil physicists. If their determinations involve two many refinements and qualifications, they may be utterly confusing to the practical roadbuilder. Simplicity is essential, and this the soil experts have barely attained in their writings; in fact, one sometimes wonders whether they do not strain a little to surround their work with mystery. Soil physics can never be elementary, and problems in the stability and bearing power of supports for engineering structures are not to be expressed by the rule of three, but this is no reason for omitting to seek the simplest solution possible.

High appreciation has been accorded to the remarkable work of the last few years in soil research. Since the first publication in *Engineering News-Record* of the fundamental discussion by Dr. Charles Terzaghi, engineering publications have followed closely the notable advance made in American soil research. Nor have practicing engineers been unsympathetic; on the contrary they have been keen to observe results and hopeful of their practical value. There is general conviction that a broad field exists in highway engineering for soil research. But the students of the subject should spare no pains to translate their discoveries and determinations into plain terms and adapt them to quick and sure use in practice.

Tunnel Concreting and Surveying at Cobble Mountain

Comparison of methods and costs of lining of two tunnels on Springfield's new water-supply and hydro-electric project—Control of lines and grades —Pantograph sections used to compute quantities

By HARRY H. HATCH

Engineer in Charge, Cobble Mountain Reservoir, Springfield, Mass., Waterworks

SHOOTING and mucking methods used on the diversion and pressure tunnels on the Cobble Mountain development of the Springfield, Mass., waterworks, were described in *Engineering News-Record*, Sept. 24, 1931, p. 507. The comparison of methods and costs on two tunnels of nearly the same size, driven under similar conditions through similar materials, is continued in the following article devoted to concrete lining and surveying. Grouting of both tunnels will be described in a subsequent article. The entire project was briefly described in the article published Sept. 24, and was described more fully in the issue of July 26, 1928, p. 124. —EDITOR.

CONCRETE-LINING methods in the two rock tunnels at the Cobble Mountain combined water-supply and hydro-electric development of the Springfield waterworks varied mainly in two respects. In the diversion tunnel (1,600 ft. long) the invert was poured first with short sidewalls, then the remaining sidewalls and arch were poured in one operation. Regular steel forms were used. In the pressure tunnel (7,100 ft. long) the invert, sidewalls and arches were poured separately. Steel-lined wooden forms were used for the arch and sidewalls.

Much attention was given to grouting in both tunnels, though the general scheme differed in each case. Careful records of both quantities and cost of grouting were kept and are summarized in the following. Detail costs and quantities of both tunnels, including concrete lining and grouting, were given in the previous article.

Concrete Lining

Diversion Tunnel—All lining in the diversion tunnel and shaft was 1:2.25:4 concrete. Specifications called for a 3-min. mix. An average of 6½ gal. of water per sack of cement was used.

The mixing plant was located at the top of the shaft. From a steam-operated mixer the concrete was discharged through an 8-in. pipe to a hopper at the bottom of the shaft. From the hopper it was loaded into 1-yd. steel dump cars, hauled by a gas locomotive.

The invert was poured first, along with 9 in. of sidewalls. Wooden forms for the sidewall sections were suspended from falsework, held in place by wires tied to expansion bolts anchored into rock on the sides. The invert was cleaned to solid ledge before any concrete was poured; no backfilling of muck, even in large overbreaks, was allowed. An average progress in pouring the invert was 47 ft. per day (41 cu.yd.), although a maximum of 158 ft. (80 cu.yd.) was reached.

The sidewalls and the arch were poured together by a pneumatic gun in 60-ft. sections. Collapsible steel forms were used (Fig. 2). Reinforced rubber pipes in the bends of the discharge pipe proved to be good for 1,000 cu.yd. of concrete. Forms were not stripped until after 24 hours. The general average progress for the sidewalls and arch was 47 ft., or 70 cu.yd. per day.

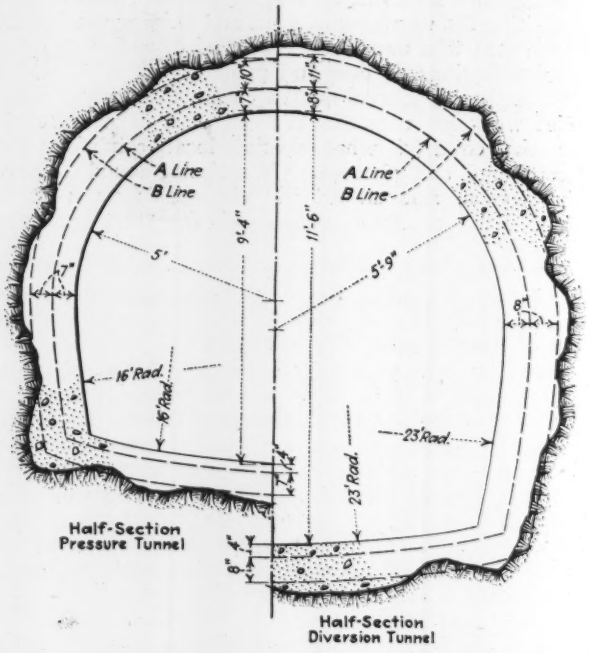


Fig. 1—Cross-sections of pressure and diversion tunnels, Cobble Mountain project

Experience has proved that it would have been better to pour the sidewalls first to the springing line, and then shoot the arch. At first the discharge pipe was located at the top of the arch, giving the concrete a 12-ft. fall into the sidewalls. This caused the segregation of aggregates, with resulting honeycomb along the bottom of the sidewalls at the beginning of the new section. At the back of the forms the concrete took a diagonal slope from the crown to the botton of the sidewalls, usually about 30 deg. with the horizontal, until the sidewalls began filling up. Along these slopes there was a distinct segregation of coarse aggregates.

At first the contractor added an admixture to the batch, but with no appreciable improvement in the mix. He then tried a richer mix of 1:2:3.5, the extra cement costing about the same as the admixture, 38c. per cubic yard of concrete. The addition of extra cement showed no improvement in the segregation of aggregates, but a more dense concrete was obtained. The original mix was resorted to, and satisfactory concrete was obtained after establishing a more strict inspection, giving due attention to placing, tamping and spading.

To eliminate the high drop of concrete from the crown to the sidewalls, the concrete pipe was placed through the form panel just above the springing line, discharging into the sidewalls first. The concrete was well spaded, and also the forms were tamped by pneumatic hammers.

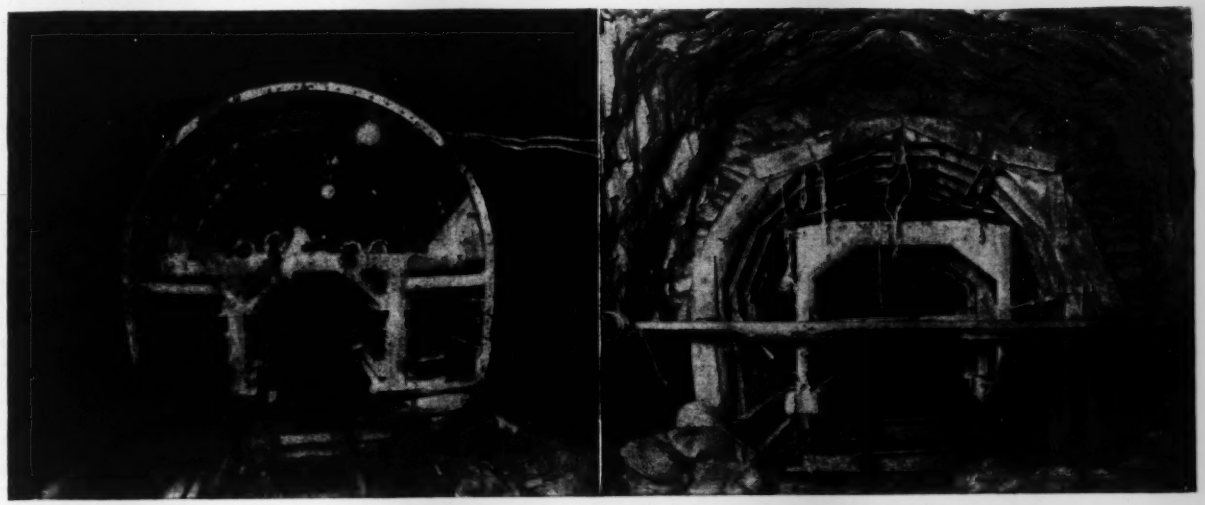


Fig. 2—Different form systems were used in each tunnel

The shaft was lined with concrete from the bottom up. The lining, partition walls, stairways and landings were poured in 10-ft. lifts.

Pressure Tunnel and Shaft Concrete—The specifications for concrete lining on the pressure tunnel were the same as those for the diversion tunnel. The tunnel muck was not suitable for concrete aggregate, requiring the installation of a crushing and screening plant in a gravel pit near the east portal. After stripping to a maximum depth of 4 ft. the pit material was found to be clean enough to use without washing. With the crushing plant working two ten-hour shifts per day, each crew consisting of one foreman, one crane operator and eight laborers, the average cost per cubic yard to the contractor was $1.50 for gravel and $1 for sand.

About 6,000 ft. of invert and 5,000 ft. of sidewalls and arch were poured from a concrete plant at the east portal. Another plant of the west portal, located at the top of the shaft, completed the shaft and the remainder of the tunnel. At the east end the concrete was discharged directly from an electric-drive mixer into 1-yd. end-dump wooden cars, which were handled by both gas and electric locomotives. At the west end the concrete was discharged from an electric-drive mixer into a 6-in. pipe leading down the shaft, the pipe discharging directly into 1-yd. cars that were moved by hand. The 6-in. pipe proved to be too small to prevent plugging and was eventually replaced by an 8-in. pipe.

The invert was poured first, then the sidewalls to the springing line and then the arch. During the pouring of the invert the night crew thoroughly cleaned the bottom of the tunnel to solid rock, far enough ahead to keep clear of the next day's concreting. No backfilling of muck, even in large overbreaks, was allowed. An average of 110 ft. of tunnel, 35 cu.yd. of concrete, was maintained in pouring the invert.

In pouring the sidewalls and arch two crews started about 2,200 ft. apart, both working toward the east portal. Steel-lined wooden forms in 50-ft. sections were made up on the job (Figs. 2 and 4). The sidewalls were kept three or four sections ahead of the arch. In pouring the sidewalls the concrete was shoveled out from a car by hand onto chutes leading into the forms. The arch was placed by the pneumatic process. In the mix for the arch the contractor, without extra charge, added 0.7 bag of cement per cubic yard to make a more workable concrete than could be obtained with the specified mix.

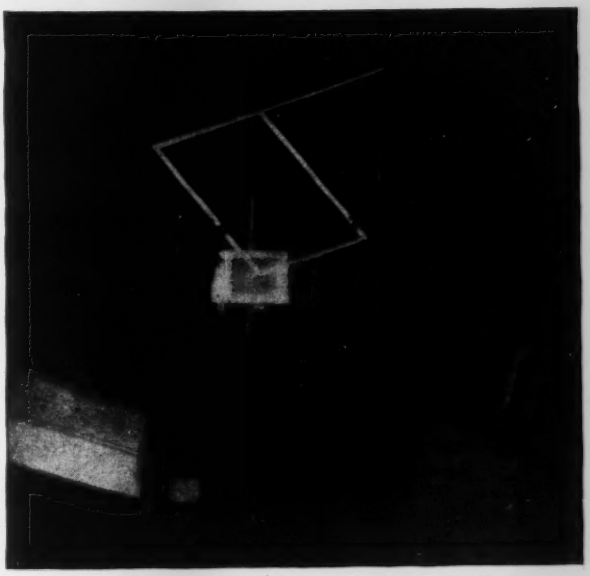


Fig. 3—Plotting tunnel sections with aid of pantograph

A crew consisting of one foreman and eight laborers was continually busy, stripping, moving and resetting forms. The concrete crew, consisting of one foreman, one concrete-gun operator and six laborers, poured 50 ft. of sidewalls and arch per shift. A careful check showed the following time schedule for the concreting operations: pour 50 ft. of sidewalls, 17 cu.yd., 3½ hours; strip, clean, oil and reset 50 ft. of sidewall forms, 5 hours; pour 50 ft. of arch, 35 cu.yd., 7 hours; strip, clean, oil and reset 50 ft. of arch forms, 4 hours. Sidewall forms were not stripped in less than 10 hours, and arch forms remained from 10 to 12 hours before stripping.

Sandbag bulkheads were permitted for both the sidewalls and the arch. This method of bulkheading proved to be very satisfactory and was much cheaper than the wooden bulkheads used in the diversion tunnel. It was found almost impossible to hold the forms true to line, due to inadequate bracing and to vibration caused by the concrete trains passing through the jumbo. An offset,

sometimes as much as ¾ in., always occurred at the springing line. The constant time of two finishers was required for chipping down and smoothing up this offset.

A 1:1 mortar of sand and cement was used for patching. In some cases, where a damp spot was too wet to support a patch, a mixture of water glass and cement was used for a quick-setting and satisfactory finish. The water-glass mix took about 30 sec. for setting completely.

The main shaft and air vent, including the landings, were poured in lifts ranging from 5 to 10 ft. Construction joints, as a rule, coincided with successive rack-support frames.

Cross-sections of both tunnels are shown in Fig. 1. The *A* line is the minimum rock line; the *B* line is the maximum payment line for both excavation and concrete. Accurate cross-sections of the tunnel were taken

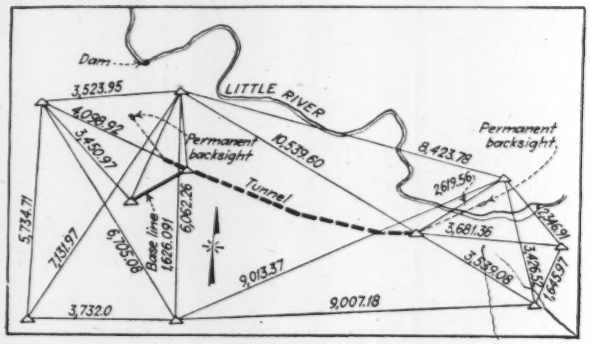


Fig. 5—Extensive triangulation system checked traverse line, establishing control of pressure tunnel

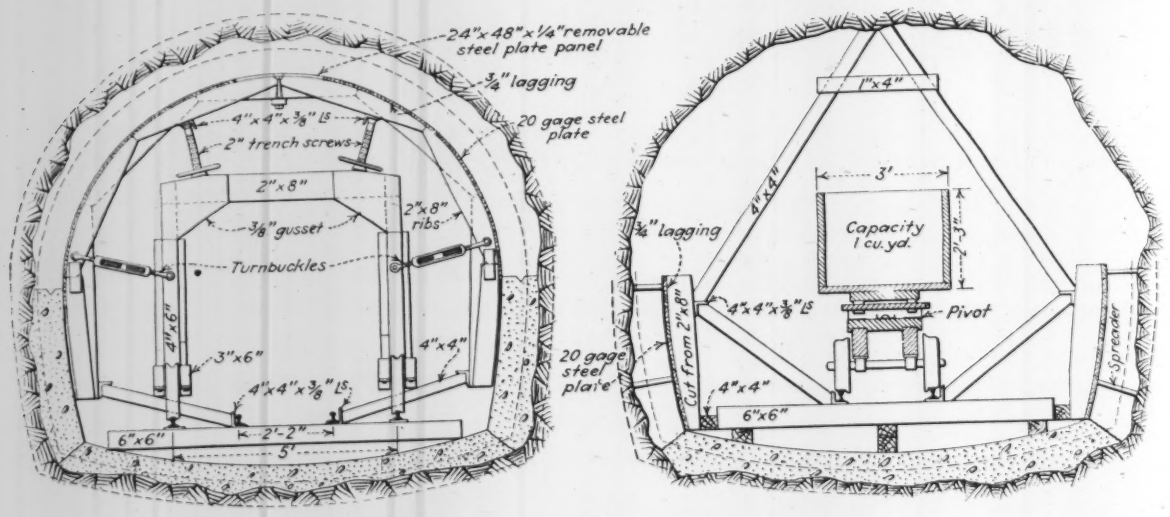


Fig. 4—Details of home-made forms used in pressure tunnel

every 25 ft., and more often, if necessary, by means of a pantograph. The pantograph (Fig. 3) was designed and built on the job. It reproduced graphically the actual contour of the tunnel section on a 30:1 scale. From the pantograph sections the exact quantity of excavation and actual amounts of concrete required were computed. A comparison of actual and paid quantities per linear foot for both tunnels is given below:

	Diversion Tunnel	Pressure Tunnel
Excavation		
Minimum, *A* line, cu.yd.	5.1	3.57
Payment, *B* line, cu.yd.	6.3	4.50
Actual quantities, cu.yd.	6.9	4.31
Excess not paid for, per cent	10.0	....
Excess payment over actual quantity, per cent	....	4.10
Concrete		
Minimum, *A* line, cu.yd.	0.9	0.65
Payment, *B* line, cu.yd.	2.1	1.57
Actual quantities, cu.yd.	2.7	1.38
Excess not paid for, per cent	30.0	....
Excess payment over actual quantity, per cent	....	12.20

Control of Lines and Grades

In laying out the pressure tunnel the portals were located with the help of topographic maps, and careful surveys with tape and transit were made on the surface over the tunnel course. The traverse was checked independently, and the resulting error of closure was one in 15,000. Later on the survey was also checked by a triangulation system (Fig. 5), the difference being only 0.6 ft. in a distance of 8,000 ft. Independent lines of levels, to the nearest 0.001 ft., were run from one portal to the other and back. Taping and leveling in the tunnel were carried to 0.001 ft. Error in meeting of the headings was only 0.1 ft. in both alignment and grade.

Lines and grades were given the heading boss at least once a day. Wooden plugs were driven into holes drilled into the crown every 100 ft., and into these plugs were driven spads serving as turning points and benchmarks and from which plumb lines were suspended for transit points. At the west heading, where the tunnel was driven from the intake shaft, the alignment was carried down the shaft by two piano wires weighted with 18-lb. plummets suspended in buckets of heavy oil. The transit picked up the alignment by trial to carry the line into the heading.

Personnel

The Cobble Mountain project is being built by the Springfield board of water commissioners, with E. E. Lochridge as chief engineer, Hazen & Everett, New York, as consulting engineers, and the author as division engineer in charge of construction. A. V. Lynn and C. Kay were resident engineers on the tunnels. Frazier-Davis Construction Co., St. Louis, was contractor on the pressure tunnel, with R. J. Burns as superintendent. The diversion tunnel contract was held by Coleman Bros. Co., Boston, with C. J. Maney as superintendent.

Building 730 Miles of Pipe Line for Gasoline

Refined at Marcus Hook, Pa., plant of the Sun Oil Co., gasoline is now pumped to Pittsburgh, Cleveland and Syracuse as well as delivered to way-stations —Design and construction features of the line

GASOLINE refined at the Marcus Hook plant of the Sun Oil Co. at tidewater in southern Pennsylvania is now being piped to Cleveland and Syracuse through a new pipe-line system that marks the inauguration of large-scale pipe-line transportation of gasoline in the East. The system involves about 730 miles of pipe—664 miles of 8- and 6-in. diameter main line and 69 miles of 2- and 3-in.-diameter branch line. Two longer lines have recently been completed in the Middle West, one by the Phillips Petroleum Co., from the Texas Panhandle field to Kansas City and St. Louis, and one by the Barnsdall Corp., from Okmulgee, Okla., to Milwaukee.

The new Sun Oil line and its construction were described by Judson C. Welliver of that company in the October issue of *Pipe Line News*. In explaining why gasoline has not previously been pumped through pipe lines, whereas crude oil has utilized this means of transportation for nearly 60 years, Mr. Welliver points out that the comparatively few great streams of crude oil required to move from producing areas to refining centers justified the heavy expense of a pipe line, while gasoline, which was distributed in comparatively small quantities to many widely separated points, could not support a pipe-line investment. Recently, however, the scale of gasoline-distribution operations of some large companies, particularly in regions of concentrated demand, has increased so enormously as to make a gasoline pipe line practical.

The Sun line takes the shape of a huge Y, its short main stem extending from Marcus Hook to Icedale, Pa., about 33 miles, where it forks, one branch going west and north to Pittsburgh and Cleveland—455 miles, including branches—the other almost north to Syracuse—278 miles, including branches. Preliminary work on the line began in 1929 with the making of aerial surveys. Airplane reconnaissance of relatively small areas followed a broad general examination of possible routes and included the taking of many strip-map photographs. Finally, a detailed location survey was made on the ground. This work, which involved right-of-way purchase, proved one of the most exacting tasks of the job, for while crude-oil lines operate between terminals and thus can follow the easiest route, a gasoline line, to be efficient, must touch as many cities and towns as possible, and this complicates survey and right-of-way problems considerably.

Actual construction of the line began in April, 1930. From Marcus Hook to the branch at Icedale the pipe used was 8 in. in diameter and weighed 26.55 lb. per foot. From this point the main lines north and west utilize 6-in., 18.9-lb. pipe. Branches are usually 3 in. in diameter. At river crossings 42½-lb. pipe was used, in addition to a strengthening collar 9 in. long welded over each joint, in turn inclosed with a 500-lb. river clamp. The greater part of the pipe was buried from 2 to 3 ft., but in some cases, as at railroad cuts, trenches were as deep as 17 ft. About 70 per cent of the trenching was done by machines, with blasting employed in rocky districts. The pipe line was gas-welded throughout. In the 733 miles of pipe there are 92,000 joints.

Special problems had to be solved at several river crossings. The Susquehanna River was crossed three times by the north line and once by the west line. At one of the crossings the river is nearly 1½ miles wide. Fortunately in the summer of 1930 the water was unprecedently low, greatly aiding in the construction. At Tamaqua, Schuylkill County, Pa., on the northern line, 2 miles of pipe was placed in the bed of the Little Schuylkill River, since there was a railroad on one bank and a highway on the other, with no right-of-way available for the pipe line. In addition to the construction

New gasoline pipe-line system of Sun Oil Co.

difficulties, the river water was highly acid. Consequently extra heavy 6-in. pipe was utilized, which after being welded and tested was incased in a 12-in. square box of redwood lumber impregnated with zinc metaarsenite, the box being poured full of hot asphalt. The cover being nailed down with Monel metal nails, the box was lowered into a trench that had been dredged in the riverbed and covered over. A similar method of incasement was used at all streams carrying dangerous acids. At the Allegheny River crossing near Pittsburgh a double line of 6-in.-diameter enameled pipe was used to protect against acid conditions in the water. The box protection used in the Schuykill River was not feasible because of navigation requirements in the Allegheny River.

At rail and highway crossings, trenches were usually bored, and the line protected from impact loads by slipping a 10-in. 32-lb. steel pipe over the gasoline pipe.

Throughout the length of the line most of the pipe was laid without any protective coating, as it was deemed to be less expensive to make tests after a few years, determine where coatings were needed and supply the protection in those sections only. However, where protection was known to be necessary three bituminous coatings were applied, covered by presaturated asbestos felt and a final spiral wrapping of kraft paper. Cooperating with the U. S. Bureau of Standards and some of the state authorities in tests of soil, corrosion and coverings, certain sections were given various experimental treatments. One interesting test involves the placing of several hundred copper electrodes to test for electrolysis in various types of soils. With wires carried to the surface, electric action can be checked periodically.

The profile of the line is very irregular, necessitating wide variations in pumping pressures at different stations. Thus at Chambersburg, Pa., 600 lb. is ample, but

at Lovely, a station farther west, 900 lb. is required. Seven pumping stations are required on the west line and two on the north line. All stations are of brick construction, and each is equipped with two electrically driven centrifugal pumps. At one station these have a capacity of 600 g.p.m. at 600 lb. pressure, while at the other stations the capacity is 350 g.p.m. at 800 lb. One pump is a standby unit and is driven by a squirrel-cage motor. The motor on the line pump is of the slip-ring type, selected for economy of operation, since it may be adjuster for decrease in pump pressure and capacity. Additional pump stations will be added when it is desired to increase the capacity of the line, which at present is about 18,000 bbl. daily. Check valves are placed at the foot of all considerable grades, and main valves at intervals of about 5 miles.

The line was built under the direction of W. C. Kinsolving and B. K. Morse, engineers of the Sun Pipe Line Co. The pump stations were designed and erected under the direction of Henry Thomas, consulting engineer of the company. Frank L. Hadley is general superintendent.

Highway Transport Burdened by Poorly Located Roads

Statistics of excess highway distances between cities—Calculations of transportation losses due to excess distances

By LOUIS E. WOOTEN
Associate Professor of Civil Engineering, North Carolina State College, Raleigh, N. C.

INDIRECTNESS of alignment and the resulting excess distance in arterial highways impose upon motor vehicle owners a cost that perhaps exceeds the vast expenditures for constructing and maintaining the entire rural highway system. The amount of this imposed cost is a product of the vehicle operating cost, the amount of traffic, measured in vehicle-miles, and the excess distance in the highways thus traveled.

The first two of these factors are generally ascertainable. The excess distance on existing highways between some of the principal cities in the Eastern and Southeastern states has been calculated, and the results are given in the acompanying table.

City-to-City	Highway Distance	Air Distance	Per Cent Difference
Washington-Philadelphia	141	122	16
Washington-Richmond	114	96	19
Washington-Harrisburg	114	97	18
Philadelphia-Allentown	54	47	15
Philadelphia-New York	94	80	17
Philadelphia-Reading	56	48	17
Reading-Allentown	36	31	16
Reading-Harrisburg	55	51	8
Hartford-Albany	119	83	43
Hartford-Boston	118	92	28
New York-New Haven	75	70	7
New Haven-New London	54	42	29
Raleigh-Richmond	161	139	16
Raleigh-Greensboro	79	67	18
	1,270	1,065	
Weighted average			19.3

The excess distance ranges from 7 per cent to 43 per cent. Nine of the fourteen sections range between 15 and 19 per cent loss in distance, the weighted average being 19.3 per cent.

An annual saving of $720,000,000 could be effected if these highways were to run directly between the principal cities. In arriving at this value the following factors are used: average loss of distance 20 per cent; present annual gasoline consumption of 16,000,000,000 gal.; vehicle average of 10 miles per gallon; one-half the total traffic on rural highways; 75 per cent of this rural traffic on the several state highway systems (as indicated by traffic surveys in Pennsylvania, Ohio, Connecticut and other states), and cost of vehicle operation 6c. per mile.

The saving that might be effected by more direct location may be illustrated in a different manner. Suppose two points 5 miles apart are to be connected by a highway 6 miles long, this representing the average loss of distance as shown in the table. If this highway is to carry 5,000 vehicles daily, with an average vehicle cost of 6c. per mile, the annual loss would be $109,500. In three years, without interest, the total would be $328,500, or enough to pay for the construction of 5 miles of highway at $65,700 per mile.

While the contour of the land and other physical obstacles would prevent the location of highways in absolutely straight lines, it may be shown that the loss of distance due to these causes is negligible except in mountainous countries or territory of very unusual terrain. Suppose, for example, that two points 20 miles apart are to be connected; if the connecting line be deviated ½ mile from the straight line at the mid-point the resulting loss in distance is but 1¼ per cent. Numerous curves may be introduced with but little loss in distance. The necessary loss in distance in typical highways seldom exceeds 5 per cent, as is well known by locating engineers.

The necessity for routing highways through or near the principal cities adds but little to the straight line distance. As examples, the distance from New York to Boston is 188 miles and from New York to New Haven to New London to Boston is 199.6 miles, or an increase of 6.5 per cent in this rather exceptional case; the distance from New York to Washington is 201.8 miles and from New York to Philadelphia to Washington is 203.3 miles, or an increase of less than 1 per cent; the distance from Washington to Raleigh is 233 miles and from Washington to Richmond to Raleigh is 235 miles, or again an increase of less than 1 per cent.

Excess distance is of little consequence to local traffic, but it is of serious moment to vehicles traveling long distances. The greater part of the traffic on state highways may be classed as long-distance traffic, as shown by the following results: In Pennsylvania 56 per cent of the vehicles on state highways are on trips of 20 miles or more, 24 per cent being on trips of more than 100 miles; in Connecticut 44 per cent are for 20 miles and over. In New Hampshire the average length of trip is 34 miles; in Ohio, 38 miles; in Vermont, 31 miles, and in Connecticut 46 miles.

The concentration of traffic on a small percentage of the total mileage is also a significant factor. In Pennsylvania more than two-thirds of the total rural traffic is carried on 6.8 per cent of the total mileage; and in Connecticut 60 per cent of the rural traffic is carried on 7.2 per cent of the mileage. Similar conditions prevail in other states.

The obvious conclusion is that the greater part of the burden of excess distance could be removed by the relocation of only the principal highways. The present conditions could have been easily averted during the expansion of highway improvement by exercising the proper foresight, planning the highway system on a regional basis, and by proper coordination of the various state programs.

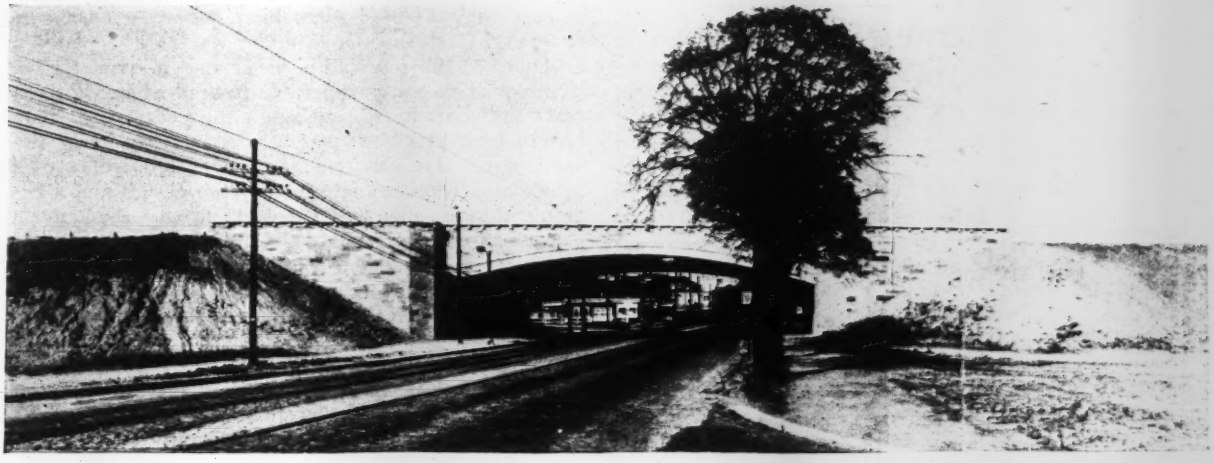


Fig. 1—New grade-separation structure on Revere Beach Parkway, Boston, is a unique steel-ribbed arch bridge incased in concrete and faced with stone

Unique Ribbed-Arch Bridge Used for Parkway Overpass

Structure near Boston resembles in appearance rigid-frame bridges developed in Westchester County, N. Y., but is designed as a three-hinged arch—Steel ribs are concrete-incased and stone-faced

TRAFFIC REQUIREMENTS at a point of grade separation between Broadway and the Revere Beach Parkway in Revere, near Boston, dictated the use of an overpass structure with characteristics similar to those of the rigid-frame bridges developed in Westchester County, N. Y. It was desirable to keep the vertical clearance under the bridge nearly constant for the full width of the underpassing street. As thin a floor as possible was also advisable to keep approach grades at a minimum. Economy in foundation and total cost and speed in erection were necessities. The form and general design of the rigid-frame bridge met these requirements in that a thin floor is permissible, the clearance beneath the bridge is nearly constant except for a slight haunching at the abutments, and a minimum of foundation excavation and concreting work is necessary. However, careful studies made by the consulting engineers who designed the bridge for the state public works department convinced them that a bridge of this general type, and offering all of its advantages, could be built as a three-hinged steel-rib arch with savings in design expense and in fabrication costs as well as in erection time. The new bridge and intersection layout as shown in Fig. 2 has recently been completed.

Steel was chosen in place of concrete for the ribs, because it speeded up erection (all of the steel was erected in a single working day) and eliminated the necessity for falsework in the heavily traveled underpassing street. Also, the bridge is on a 30-deg. skew, and steel was believed to simplify the design problem over concrete for such a condition.

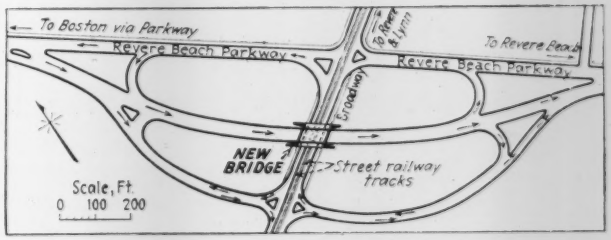


Fig. 2—Revere Beach Parkway-Broadway grade-separation project includes an extensive clover-leaf layout of roadways

The bridge is a single-span structure 71½ ft. between abutments, with a 50-ft. roadway and a 2½-ft. sidewalk on either side. The extensive grade-separation layout of which the bridge is the central unit is shown in Fig. 2. The layout is planned to make possible an uninterrupted flow of through traffic on both of the main intersecting streets and to eliminate all left turns. The bridge provides a vertical clearance for the underpassing street that varies between the narrow limits of 13 ft. at the curb and 17 ft. at the center. Foundation concrete was carried from 6 to 12 ft. below the surface of the underpassing street, with the hinge shoes set from 2 to 5 ft. below the same datum. Wing walls 33 ft. long, varying in thickness from 8½ ft. at the abutments to 4½ ft. at the ends, were constructed to retain the fill at either end.

Steel Frames—The framework consists of eleven steel ribs with pin hinges at the base and a rocker-type hinge at the center. The vertical legs of the ribs are built-up

members utilizing a 36x½-in. web plate and four 6x4x⅝-in. flange angles. Each half of the horizontal portion of the rib is a girder 7½ ft. deep at the haunch and 1½ ft. deep at the crown. In the first three panels of this member an open web is utilized, while the webbing in the three end panels is a ⅜-in. plate. The top chord is horizontal, the bottom chord curved, with a rise of about 6 ft. In effect each half rib (comprising the vertical leg and half of the horizontal girder) is a bent cantilever, hinged at the base.

The frames are braced transversely at the quarter points and at the center. Horizontal struts are utilized between the vertical legs of the frames at the top, at the bottom of the haunch and just above the pins. Diagonal bracing is used between the vertical legs, and these legs are incased in concrete to form a suitable abutment and to provide additional stability.

Fig. 3—Steel frames ready for concrete incasement

Pins—The 3¼-in. bottom hinge-pins rest on a simple structural-steel shoe built up of angles and plates and anchored to the foundation by four 1-in.-diameter bolts. These pins take a considerable portion of the horizontal reaction from the rib, although the pressure of the fill behind each abutment was utilized as a resisting force, as is done in rigid-frame bridge design. One of the principal differences betwen the arch design and a rigid-frame design occurs at the haunch. In the latter the stresses are carried around the bend, large tensile stresses occurring in the outside flange and relatively large compressive stresses in the inside flange; a consequent structural requirement is the use of numerous stiffeners fitted between the flanges, radiating outward from the haunch. In the arch design the major part of the load is brought to the vertical leg as compression in the lower chord of the girder. In effect, therefore, the vertical leg of the arch bridge is a beam with a concentrated load at the haunch point. This load is distributed to the back flange of the vertical leg through a few horizontal stiffeners, closely grouped. A light tieplate serves to transfer the tension from the top chord of the girder to the back flange of the vertical leg. The designers believe that fabrication of these details is considerably simpler than for corresponding parts of a rigid frame.

Computations showed very little rise and fall due to temperature at the center of the arch, so that the necessity for a pin hinge at this point was eliminated. The crown hinge used is a simple "finger-plate" design. The ends of the two half-girders are faced where they come together. A 1-in. plate is fitted to one end with countersunk rivets. Similarly, two ¾-in. plates are fitted to the end of the abutting half-girder. When the ribs were erected the 1-in. plate slipped between the two ¾-in.

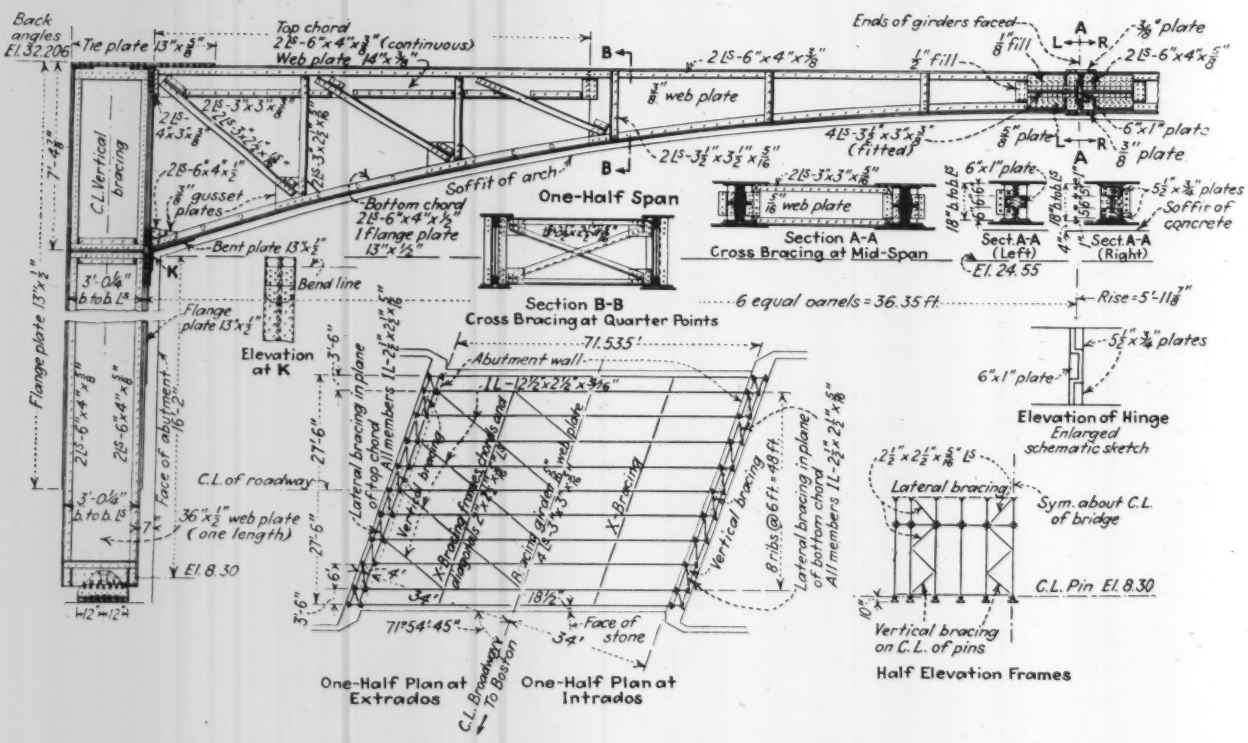


Fig. 4—Details of three-hinged steel-arch rib, Revere Beach Parkway bridge

All steel was erected in one day, using a crawler crane to set up the fabricated frames, which came to the job in four pieces.

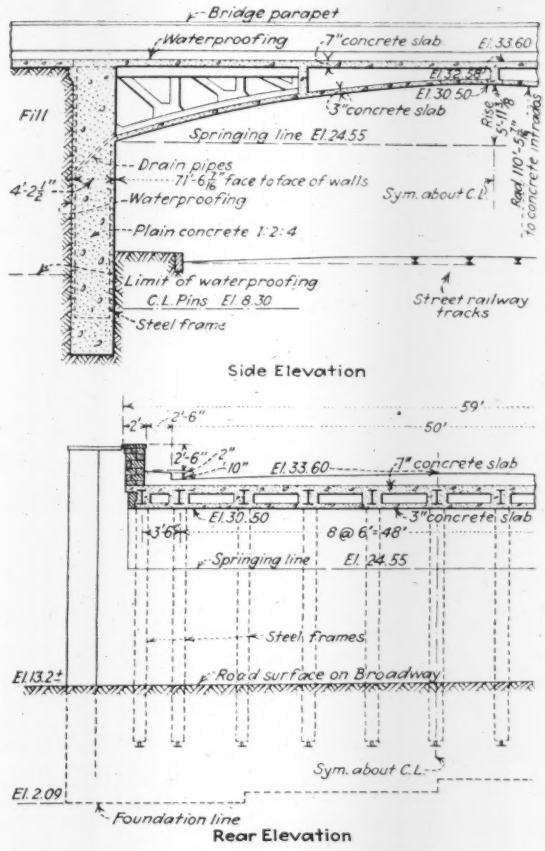


Fig. 5—Three-hinged steel arch ribs incased in concrete and resembling rigid-frame in appearance, comprise structural elements of Revere Beach Parkway bridge

plates, forming the hinge. In effect the joint formed is more of a shear connection than a hinge, but it permits some hinge movement on the ¾-in. bearing surface provided.

Erection—The ribs were received in the field in four pieces—two legs and two half-girders to each rib. For erection purposes a timber bent was set up beneath the crown hinge to support the outer ends of the half-girders. These were then lifted into place by crawler cranes and connected to the legs, which had been up-ended in place. The connection at the haunch was the only field joint required to complete each rib. Traffic beneath the structure was maintained at all times. All steel was erected in a single working day.

With the ribs and sway frames in place, complete concrete incasement was applied. The vertical legs were incased in a plain concrete abutment 4 ft. 2½ in. thick, providing about a 6-in. covering front and rear. The top chord of the arch was concreted into the 7-in. roadway slab, and the remainder of the rib was completely incased, a 3-in. concrete slab providing a smooth barrel surface on the under side of the arch.

As a final operation the entire structure was faced with laid-up stone. The voussoir stones, outlining the arch barrel, are of split gray granite. The remainder of the structure, including wing walls and parapet, is faced with long narrow stones of broken-seam granite in a variety of colors, laid up in three- and four-header design. The under side of the arch was bush-hammered and painted with two coats of portland cement paint.

Personnel—The Revere Beach bridge was built by the Massachusetts department of public works. A. W. Dean is chief engineer and George E. Harkness is bridge engineer. The cost of the bridge structure was about $55,000. The total cost of bridge and approaches was $180,000. J. R. Worcester & Co. consulting engineers, Boston, designed the bridge for the public works department. M. McDonough, of Saugus, Mass., was general contractor. The Boston Bridge Works, Cambridge, Mass., fabricated and erected the steel.

Weather Bureau Report Reviews Drought

Drought in the Northwest this year and effects of last year's drought in many sections were the outstanding features of the year's weather, according to the annual report of C. F. Marvin, chief of the U. S. Weather Bureau, for the fiscal year ended June 30, 1931. The bureau has adopted a definition of drought, which reads: "A lack of rainfall so great and long continued as to affect injuriously the plant and animal kingdoms and to deplete water supplies both for domestic purposes and for the operation of power plants, especially in those regions where the rainfall is normally sufficient for such purposes."

Last winter was abnormally warm and dry in the greater part of the United States, the report says. The temperature averaged from 4 to 16 deg. higher than normal in central and northern areas of the country, and there was a marked absence of extremely cold weather. It was the driest winter on record in Alabama, Indiana, Illinois, Michigan, Wisconsin, Iowa, Minnesota, North Dakota, Montana, Wyoming and Oregon; and the driest since 1900-01 in New York, New Jersey, Pennsylvania, Maryland, West Virginia, Kentucky and South Dakota. Only five states had as much as normal rainfall. The dryness was apparent also in the Western snowfall. New Mexico was the only Western state having as much as the normal winter snowfall. Spring precipitation was about normal, though all states between the Rocky and Appalachian mountains had deficiencies, with the greatest shortages in the Northwest, principally in North Dakota and Montana. In Iowa and North Dakota it was the third year with deficient rainfall, in Montana the fourth. In Minnesota the rainfall has been deficient every year since 1919.

Further drought influence is found in the section of the report dealing with river and flood conditions. There were no important floods in any part of the country, and the dry weather made many of the streams unprecedentedly low. This made flood warnings unnecessary, but the period was valuable for the river forecasters, as it gave an opportunity for the uninterrupted study of forecasting methods.

The bureau continued its snowfall measurements in the mountain snowfields of the Western states. So many requests are made for this work, much of which is strictly local in nature, that the bureau plans an arrangement under which it will make only general observations.

In 1927 the bureau, after having used a four-cup type of anemometer to measure wind velocity since 1872, changed to the three-cup type. By January, 1932, it expects to be using the four-cup type again, as this has been found to be a more accurate means of recording wind velocities.

Work Starts on a National Hydraulic Laboratory in Washington

New structure will fill a long-felt need for adequate facilities for studying the many hydraulic problems of the several federal departments and will provide opportunities for important private research

By BLAKE R. VAN LEER
Assistant Secretary, American Engineering Council, Washington, D. C.

AFTER YEARS of planning and of campaigning to stimulate the necessary general interest, as well as to overcome direct opposition to the building of a large hydraulic laboratory in the national capital, the construction of such a laboratory has been begun. It is being built adjoining the buildings of the Bureau of Standards and will be operated under the direction of George K. Burgess, director of the bureau.

The idea of a national hydraulic laboratory originated with John R. Freeman, of Providence, R. I. After many vicissitudes the persistent efforts of the organized engineers, acting through American Engineering Council, with the legislative assistance of former Senator Joseph E. Ransdell and Congressman James O'Connor, resulted in the passage of a bill authorizing the establishment of such a laboratory. The bill became law when signed by President Hoover, May 14, 1930.

The law authorized construction of a laboratory for the determination of fundamental data useful in hydraulic research and engineering, including laboratory research relating to the behavior and control of river and harbor waters and the development and testing of hydraulic instruments and accessories. It prohibits laboratory studies upon work under the jurisdiction of any governmental departments unless the work is requested in writing by the head of the department concerned. The law further provided that cities and states may avail themselves of the use of the laboratory.

The passage of the authorizing act was quickly followed by passage of an appropriation of $350,000, which became available July 1, 1930. George K. Burgess, director of the Bureau of Standards, promptly set his staff to work making preliminary plans, and as an aid he appointed a national hydraulic laboratory advisory committee composed of: J. P. Dean, office of Chief of Engineers; John R. Freeman, consulting engineer, Providence, R. I.; William B. Gregory, professor of experimental engineering, Tulane University, New Orleans, La.; N. C. Grover, chief hydraulic engineer, U. S. Geological Survey; Ely C. Hutchinson, editor, *Power*, New York; E. W. Lane, Reclamation Bureau, Denver, Colo.; S. H. McCrory, chief, Division of Agricultural Engineering; Lewis F. Moody, consulting engineer, Cramp-Morris Industrials, Inc., Philadelphia; Raymond S. Patton, director, Coast and Geodetic Survey; Sherman M. Woodward, professor of mechanics and hydraulics, University of Iowa, Iowa City; and Blake R. Van Leer, assistant secretary, American Engineering Council.

This committee has held several meetings at which it considered and offered advice on various fundamental

Simplicity of framing places a minimum of restrictions upon future rearrangement of the laboratory

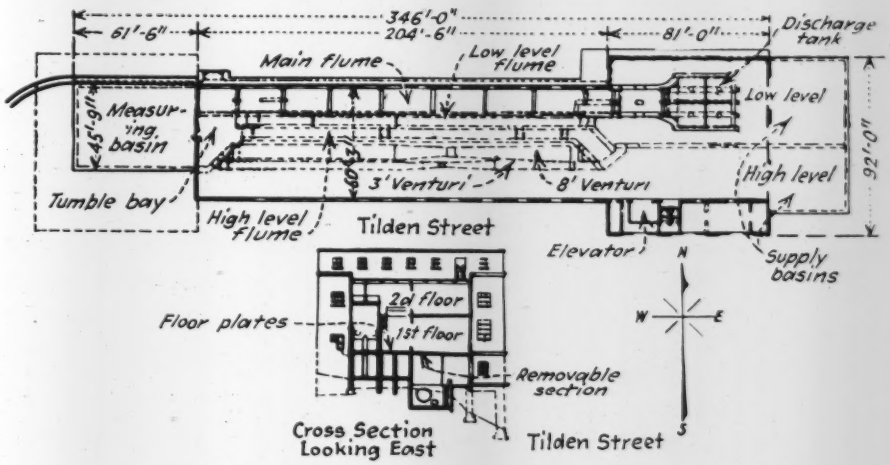
questions concerning the plans and construction of the laboratory.

Construction Under Way

The contract for the construction of the laboratory has been let to Stoufflet & Tillotson, of Philadelphia, at a price of $294,887. The foundations and frame of the laboratory have been completed, and it is expected that the structure will be ready for occupancy by the first of April, 1932. Undoubtedly, by this time next year most of the permanent equipment will be installed and calibration of the various devices will be under way.

The building is located to the south of buildings of the Bureau of Standards, but at a lower level on a terrace adjacent to Tilden St. It will be a brick and steel structure trimmed in stone. There will be a basement, mostly below ground except on the Tilden St. side, and two main floors. Provision for a third floor is to be made, should future demand warrant it. There is ample room for extensions and additions in length to the west of the laboratory. The basement has a total length of 384 ft. and a maximum width of 92 ft. The superstructure has the same maximum width but an over-all length of 286 ft.

The basement will contain a high-level supply basin, a low-level supply basin, low- and high-level return flumes, diversion channels, a measuring basin, shops and model construction rooms. The first floor will contain the main experimental flume (12 ft. wide, 12 ft. deep and approximately 234 ft. long), the switch room, pump and machinery room, offices, computation and conference rooms. The over-all length of the first floor is 286 ft.



Major features of the national hydraulic laboratory

Comparison With Other Hydraulic Laboratories

The quality and quantity of work produced by any research laboratory are much more dependent upon the ability and industry of its director than upon its physical dimensions or equipment. Furthermore, it is very difficult to secure an adequate measuring stick with which to compare hydraulic laboratories. The laboratories of the past have all been built from different motives and with widely varying financial resources. One outstanding fact about the new laboratory at the Bureau of Standards is that more money is available for its construction than was available for any existing laboratory, and it will have a larger yearly operating budget.

Much recent discussion of the laboratory has centered around the question of water capacity—that is, the maximum number of cubic feet per second which the laboratory is capable of using experimentally. A comparison along these lines is shown in the table on p. 998.

Purpose of the Laboratory

Many engineers desire to know who may avail themselves of the hydraulic laboratory when it is ready for use and what particular problems may best be solved there.

Although the laboratory is being built primarily for the study of the hydraulic problems of the federal government and its various engineering agencies, such as the Bureau of Agricultural Engineering, Bureau of Public Roads, Coast and Geodetic Survey, U. S. Geological Survey, Reclamation Bureau and the Corps of Engineers, the law provides that it may also be made accessible to state authorities and municipalities upon request. It will also be available to private engineers for such tests as cannot be performed elsewhere and for which they are willing to pay the actual cost of performance.

It is very doubtful whether the laboratory will be ready to undertake any research work until the latter part of 1932 because of the long time involved in the installation of equipment and the adjustment and calibration of instruments.

The design of the laboratory is such that it can undertake the study of any of the known problems confronting hydraulic engineers today. Obviously the laboratory will not be able to make all these studies on full-scale models, but all can be studied on scales that should prove adequate. Previous experience indicates that extremely valuable fractional-scale model studies can be carried on at a cost that will be repaid many times over and that the scale effects in such studies can be determined within limits of engineering accuracy. It is not necessary, therefore, and in most cases it is not desirable, to attempt studies upon full-scale models in a laboratory. Such investigations can best be carried on in the field where the hydraulic structures are actually in use.

Hydraulics vitally concern every industry and business in our country. Knowledge of the laws of hydraulics is essential to the construction and operation of all water supply systems, sewage systems, pumps, power plants and irrigation projects. With the increase in accuracy demanded in these, as in many manufacturing processes, there has come a greater demand for accuracy in knowledge of hydraulics. The early experimenters were content, in fact were quite justly satisfied, if the coefficients and data obtained checked within a few per cent. For most design work this was sufficient, but the time has come when engineers need to know accurately the limits of a multitude of coefficients used in hydraulics. Most fundamental hydraulic laws are based upon ideal assumptions that in practice are not and cannot be realized. Hence these theoretical deductions in most cases have to be modified by so-called empirical coefficients.

MAXIMUM CAPACITIES OF LEADING HYDRAULIC LABORATORIES

Location	Max. Q, Sec.-Ft.	Longest Flume: Width, Ft.	Depth, Ft.	Usable Length, Ft.	Remarks
Berlin, Germany	....	26.9	13.8	492	(Towing tank)
Beauvert, France	83.2	.....	.....	.....	
Bonlève, France (River Garonne)	707 – 3-mo./yr. 350 – 9-mo./yr.	11.5	13.1	.....	
Budapest, Hungary	0.7	1.97	.....	26.2	Hydr. Struct. Lab., Royal Joseph Univ.
Berlin, Germany	0.21	0.32	1.18	9.85	Technical Univ.
Birmingham, Ala	35.0	.....	.....	.....	
Brunswick, Germany	3.5	5.5	1.47	32.8	
Brann, Czechoslovakia	8.8	11.48	2.03	65.6	
Charlottenburg, Germany	8.8	6.56	1.64	100	
Cornell University	400	16	17.7	420	
Darmstadt, Germany	5.65	8.2	7.22	98.4	
Dresden, Germany	7.06	3.28	4	115	
Danzig, Germany	8.7	2.13	5.25	91	
Delft, Holland	2.3	.....	.....	.....	
Gratz, Austria	7.0	14.75	.....	65.6	
Hannover, Germany	6.3	1.64	1.64	34.5	Wasserbau—Tech. U.
Hannover, Germany	32.0	4.25	3.6	56.0	Hyd. Mach.—Tech. U.
University of Iowa	100.0	10	10	190	
Karlsruhe, Germany	11.4	7.5–16.4	2.1	82.0	
Leningrad, Russia	1.75	6.56	1.64	65.6	
Munich, Germany	77.5	.....	.....	.....	Hyd. Mach. Lab.
Manchester, England	12.0	3.5	4	45	
Milan, Italy	.....	.....	.....	.....	Riva Const. Co.
Milan, Italy	.....	6.6	4.83	85	Tech. Univ.
Obernach, Germany	283	9.85	4.92	1,148	Forschungs Instituts, (outdoors)
Padua, Italy	17.5	3.28	.....	127	
Pisa, Italy	2.15	2.0	0.66	29.5	
Prague, Czechoslovakia	177	8.2	7	550	
Rome, Italy	17.5	6.56	5.58	230	
Stockholm, Sweden	19.0	9.8	4.9	186	
Stra, Italy	.....	.....	.....	656	Towing tank
Trondhjem, Norway	3.4	6.6	2.1	41	
Tashkend, Turkestan	31.8	19.7	11.5	386	
Vienna, Austria	8.8	4.2	3.1	19	J. Pfletschinger & Co.
Vienna, Austria	11.6	9.85	3.28	88.5	Exp. Inst. for Hydr.
Wilhelmshaven, Germ.	3.75	46.0	0.98	83.7	Towing tank
Zurich, Switzerland	140	6.7	6.56	180	
Washington, D. C.	250–300	12	12	234	

The coefficients that today enrich our knowledge of hydraulics have been determined largely by college professors working in small laboratories. Some coefficients were determined over 100 years ago and there are indications that these are in serious need of scientific and accurate rechecking. The national hydraulic laboratory will be well equipped to do this. Probably some of its first work will be along these lines.

Specifically, the laboratory will also be equipped to study the following problems: lock-filling devices, silt-charged water flow, flow in tunnels, flow through all kinds of valves, scour below dams, backwater profiles and similar studies, location of thread of river after alteration due to construction work, spillways, hydraulic jump, chutes, transition sections, loss of head in pipe bends and channels, entrainment of air, head losses around piers and abutments, effect of channel shapes upon current-meter accuracy, comparative study of water-measuring devices, venturi flumes, broad crested weirs, piezometer connections, model and similitude laws. These are only a few of the hundreds of problems that have already been filed with the director of Bureau of Standards and which will be given consideration as rapidly as possible.

The laboratory is to serve as a clearing house of fundamental knowledge upon the subject of hydraulics. There one may go with the expectation of securing the accumulated knowledge of the past and present. To that end a highly specialized and complete reference library is to be assembled in the new building. The laboratory will also assist as a coordinating agency for all laboratories conducting hydraulic research in the United States. It will thus serve as a most beneficial aid in such studies.

Through Traffic Furnishes Little Local Trade

Traffic count at Lafayette, Ind., shows that only fourteen per cent of through cars stop long enough to buy

By BEN H. PETTY
Professor of Highway Engineering, Purdue University, Lafayette, Ind.

TO GATHER factual information on the controversial question of whether town and city merchants are materially benefited from increased trade by having state highways routed down "Main Street," the writer directed a small group of senior engineering students in a traffic study during the past few months. A survey was conducted to determine the number of out-of-state cars stopping at the city of Lafayette, Ind., while passing through over U. S. Road No. 52, which is the shortest route from Chicago to Cincinnati by way of Indianapolis.

An observation station was located at the northwestern edge of West Lafayette and another at the southeastern edge of Lafayette, about 4½ miles apart. Two observers were assigned to each station, who noted the state from which the car came, the license number and the time of entry and departure of all foreign cars. (They merely counted the Indiana cars.) County cars were recorded separately. These data were secured on seven different days over periods from 3½ to 4 hours from Oct. 23 to Dec. 31. The accompanying table gives the results of these observations.

TABLE I—DATA ON FOREIGN CARS PASSING THROUGH LAFAYETTE, IND. ON U. S. ROAD 52

Date, 1930	Hours Duration of Count	Out-of-State Cars: Station No. 1 Northwest	Station No. 2 Southeast	Cars Traced	Passing: Passage Exceeding 20 min.	Per Cent Stopping in City
Oct. 23	3	133	79	65	18	27.7
Nov. 5	3½	93	95	61	16	26.2
Nov. 6	2½	96	86	42	9	21.4
Dec. 2	2½	84	77	34	12	35.3
Dec. 29	3½	146	146	83	23	27.7
Dec. 30	4	143	116	64	20	31.2
Dec. 31	3½	124	106	72	12	16.6
Total	...	819	705	421	110	26.1

Analysis of Observations

It was determined by trial runs that 20 min. was a reasonable time interval for the passage between stations, allowing for delays due to stop lights, traffic blockades, etc. All cars requiring more than this time were assumed to have stopped in the city, and presumably the occupants did some shopping.

Of a total of 705 foreign cars passing station 2, 421 were traced between stations and their time of passing through the city was computed. Only 110, or 26 per cent, required more than 20 min., so it may be assumed that the occupants of the remaining 311 cars, or 74 per cent, could not have spent any money in the city. Of the 110 cars requiring more than 20 min. passage time 50 per cent passed through in less than 30 min. For this latter group, the majority of stops may be attributed to purchases of gasoline and oil or to other quick sales. This leaves only 14 per cent of the foreign cars that spent enough time in Lafayette for any extensive purchasing.

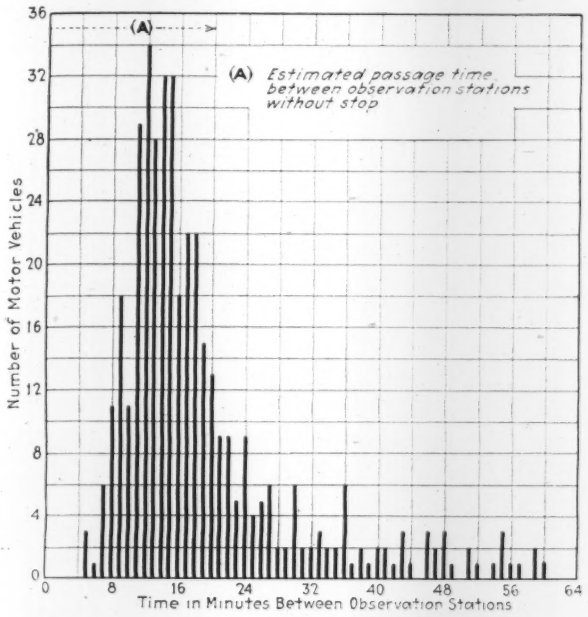

(A)
(A) Estimated passage time between observation stations without stop
Number of Motor Vehicles
Time in Minutes Between Observation Stations

Fig. 1—Time taken by out-of-state cars passing through Lafayette, Ind.

A total of 3,234 cars were observed passing one station, which for the period covered gives an average of 144 cars per hour over U. S. Road 52. This traffic and that of other state roads entering Lafayette is now routed through the business district of the city, creating various degrees of congestion, which becomes highly objectionable on week-ends, holidays and other special occasions. It is an added menace to pedestrians and local cars, interferes with local business traffic and greatly increases wear and tear on street pavements. Damage to streets is particularly true of the rapidly increasing number of heavy freight trucks and trailers passing through on regular schedules.

Fig. 1 illustrates graphically the passage of out-of-state cars between the two observation points. Fig. 2 gives a graphical comparison of the number of out-of-state cars passing through the city and the number stopping, even for a short time, in the city. Fig. 3 shows a typical traffic count on U. S. Road 52 divided into various classifications of traffic.

Significance of Findings

Lafayette and West Lafayette have a combined population of about 32,000, and there is no competing city of equal size within 40 miles. Despite the fact that Lafayette is larger than any neighboring county seat, the traffic records show a slight preponderance of Tippecanoe County cars in the total Indiana cars on this particular route.

Based on this rather limited traffic census it is quite evident that foreign traffic passing through Lafayette on the route observed contributes very little to the city's business. The preponderance of Tippecanoe and adjacent county motor traffic on this state road would indicate that local traffic contributes far greater value to city merchandising than do out-of-state cars. Although these recorded Indiana cars entered the city on route 52, most of this traffic probably originated off this road and had to traverse local roads to reach this inlet to Lafayette. This is a further indication of the urgency of greater interest on the part of business men in the proper development of local roads in their logical trade area. The proof of this thesis would be much more striking in any of the neighboring county seats, all of which have less than 10,000 population.

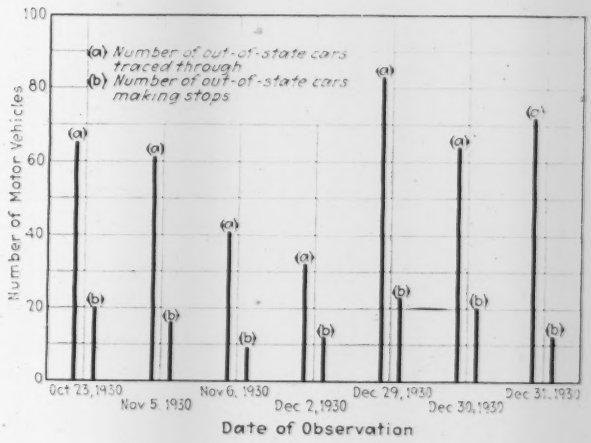


Fig. 2—Relation of total cars to number making stops

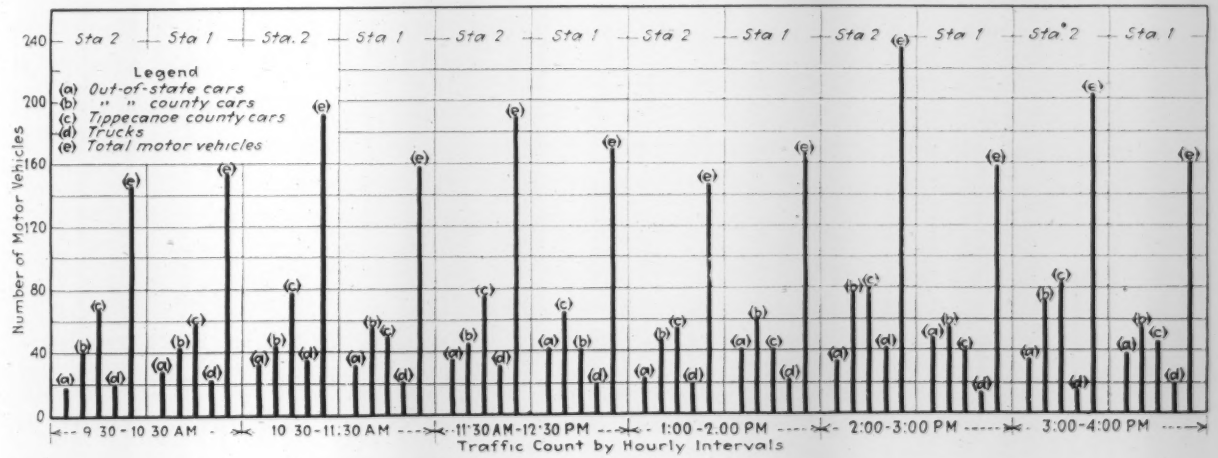


Fig. 3—Total traffic classified as to origin and kind

New York Subway Construction—VI

Steel Erection and Concreting Methods

Contractors' plant, equipment and methods used in placing structural steel and concrete for subway structures vary widely

THE CONSTRUCTION of the subway structure itself, though usually proving less difficult than excavation, shoring and street decking, is of interest because of the widely varying methods used by contractors on similar work. Typical examples of various methods and descriptions of plant and equipment are given in this article. Previous articles in this series of New York subway construction have appeared Aug. 7, 1930, p. 200; Sept. 4, 1930, p. 371; Sept. 18, 1930, p. 455; Nov. 20, 1930, p. 796; and Jan. 27, 1931, p. 136.

—EDITOR.

BUILDING the permanent structure for extensions of New York City's rapid transit system—that is, placing the steel and concrete—is considered by the contractors as the minor portion of the work. After the excavation, street decking, building and elevated railway underpinning have been completed and the utility changes made, the actual construction of the subway structure is comparatively easy.

Central mixing plants predominate on subway work, though central batching plants in combination with mixers at the site of the work and transit-mixed concrete are both used on many jobs. The development of the light truck and tractor cranes has simplified steel erection. Steel erection and concrete pouring often proceed together, usually directly behind the final excavation. In soft ground and where the timbering system permits, the concrete floor is sometimes kept close to the excavation work to provide runways for dirt trucks and for steel-erection equipment.

This article considers only the construction of the subway structure in open cuts. A description of tunnel sections of the subway will be given subsequently.

Steel Erection

Conditions under which steel is erected can be divided into three classes: erection in open cuts where street decking is not required; erection through decking and timbering from the surface; and erection from the sub-

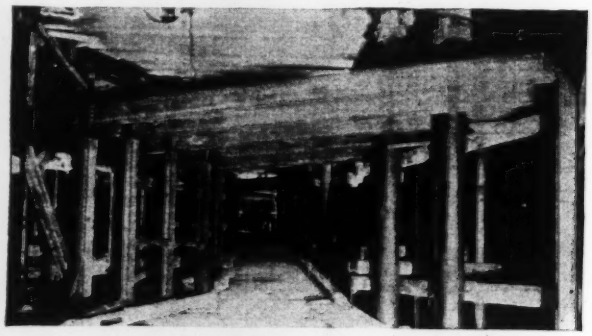


Fig. 2—Erecting subway steel was difficult here

Structural members were jockeyed into place among a forest of pipe piles underpinning Brooklyn Bridge plaza on Nassau St. line.

Fig. 3—Trucking an unusually heavy girder down a subway construction ramp

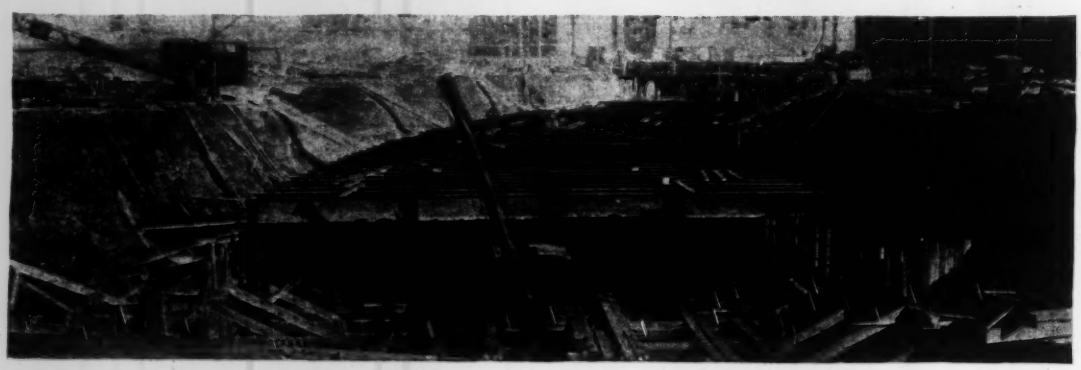


Fig. 1—Setting steel on an open section of New York subways

Crane on bank at left unloads steel from trucks and relays it to erection crane in cut.

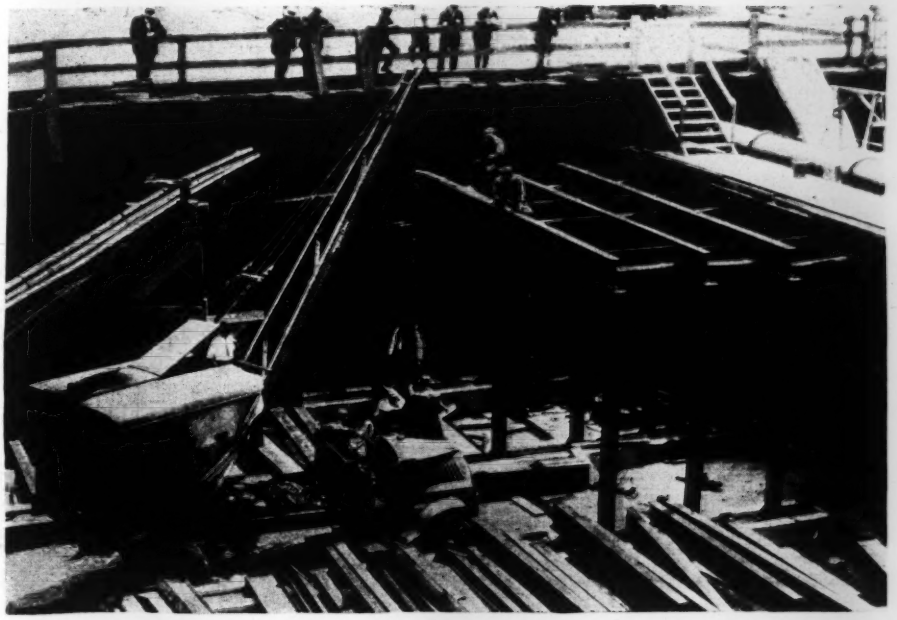


Fig. 4—Truck cranes are popular for erecting subway steel

way grade beneath street decking. This last condition prevails on a majority of contracts.

Most of the steel framing is of simple design, consisting of transverse bents spaced 5 ft. on centers. At stations, crossovers, connections and crossings the framing is often complicated. Tracks dip beneath and over each other or run at varying levels, which complicates the subway structure. At several places on the new system the tracks and stations are within private property, secured by the city through purchase or easement rights. It is general practice to wreck buildings existing on such lands and to incorporate into the subway structure foundations to carry future buildings. Erection of the heavy steel required by such conditions is simplified by being in the open, unhindered by street decking and bracing.

Steel deliveries are necessarily made by truck, usually direct to the contractors' storage yards. Because of lack of storage space on most jobs the steel is not brought to the work until actually required. Vacant lots and curb spaces are used wherever possible for temporary storage.

Three types of cranes are widely used for steel erection: heavy gas or diesel cranes on crawler trucks (Fig. 1), truck cranes and small light tractor cranes. Of these three types the truck cranes predominate. Their easy mobility, coupled with a lifting capacity of 5 or 6 tons, makes them a popular piece of equipment on nearly every subway job (Fig. 4).

Erecting steel through the street decking from on top is used extensively by only a few contractors. Rodgers & Hagerty, on a Brooklyn contract, used the old type street decking with posts 10 ft. on center both ways and the deck cut up into 10-ft. square panels, and handled all work, excavation, steel erection and concreting, from the deck. Heavy crawler cranes set the steel on this job.

On other contracts portions of the steel are handled from on top. Frequently in tight places steel members are brought in on subgrade level but lifted to place by a line dropped through the decking from a crane on top.

On a great majority of subway contracts the steel is erected beneath the street decking from subgrade level by small crawler and tractor cranes. The relation between excavation, steel erection and concreting varies with individual contractors and according to ground conditions. In soft or wet cuts the concrete invert is usually kept close to the final excavation. This provides runways for dirt trucks and steel-erection cranes and also serves as a bottom support for trench bracing. On hard and rock bottoms usually the column pedestals only are poured before the steel is erected, leaving the floor concrete to be placed at the time of pouring the walls and the roof.

As stated in a previous article in this series, the posts and bracing for street decking are carefully placed so

Fig. 5—One of a variety of trucks used to transport mixed concrete from a central plant to the job

Other types commonly used include dump, hopper and agitator bodies.

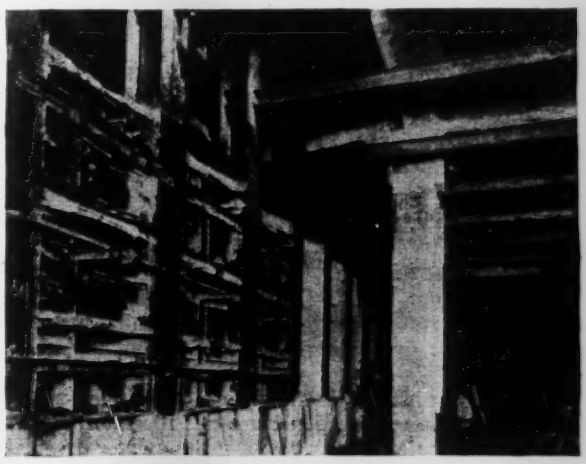


Fig. 6—Steel forms used for sidewall jack arches

Steel forms are also favored for roof arches, though some contractors prefer wood panels for both walls and roof.

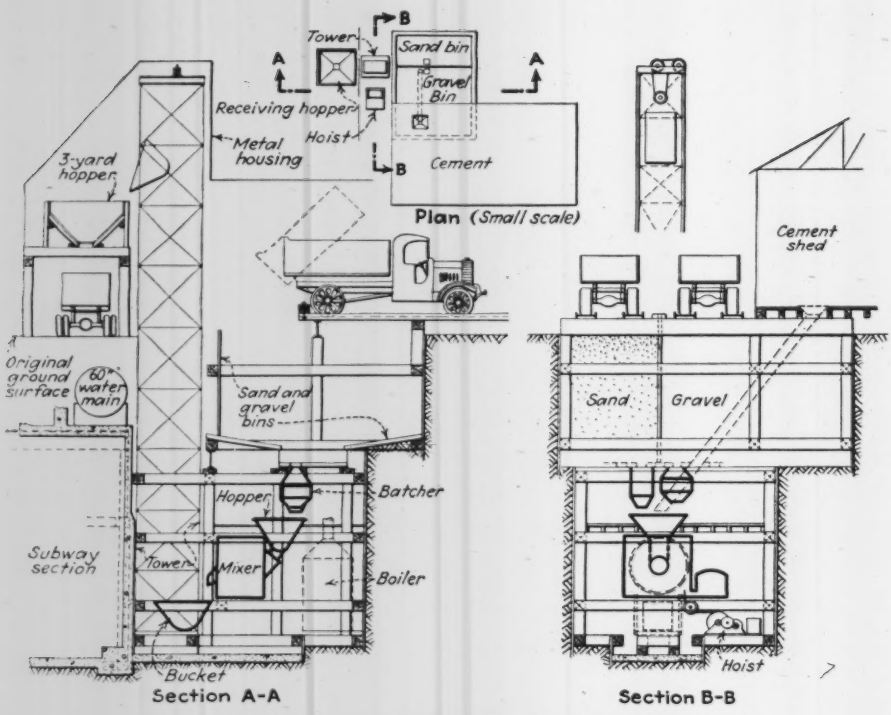


Fig. 7—A compact and efficient underground central concrete plant built by Hart & Early, Inc., on a Brooklyn subway contract

as not to interfere with the steel erection. The clear working space provided by the use of long span beams in the decking system permit the maneuvering of small cranes in placing steel.

There are times, however, when steel erection is not an easy task. Fig. 2 shows a difficult bit of steel placing on the north end of the new Nassau St. line. Here the subway trench was full of underpinning piles holding up the Manhattan approach of Brooklyn Bridge. In many other places setting steel is a laborious process, requiring the jockeying of the beams around the bracing and underpinning.

Concreting

Forms—The regularly spaced steel bents of the subway structure permit extensive use of sectional forms for the jack arches in both roof and sidewalls (Fig. 6). Many contractors are using collapsible steel forms throughout; others use wood panels for sidewalls and steel forms for the roof, while some prefer wood forms throughout. Wood forms are often built up in collapsible sections, similar to those made of steel. Panel forms, both steel and wood, are usually fastened to the lower or inside flanges of the steel beams.

In the various subway sections there are found just as many methods of handling and moving forms as there are types of forms. Usually the roof-form sections are handled from below by means of a traveling scaffold. The scaffolds run on rails and are adjustable in height. Some of them are also rigged up to handle sidewall forms.

Backwall forms vary with ground conditions. Specifications for the subway structure call for waterproofing the backs of the sidewalls below groundwater level, the waterproofing to be protected by a 4-in. concrete wall. This extra concrete backwall complicates the formwork, and the various contractors have different methods of building forms. In one method the sheeting and excavation line is set far enough outside the neat concrete line to permit a regular backform to be built for the subway wall. After this form is stripped the backwall is waterproofed, and then another form is built for the narrow protection wall. Another method in general use is to drive the sheeting as close as possible on the concrete neat line. Then the sheeting is used as a backform for the protection wall, which is built in advance of the subway wall. Waterproofing is then placed on the inside face of the protection wall, and this face is utilized as the backwall form of the subway structure.

Concrete Placing—Every contractor on subway work has his own pet scheme of concreting operations. Almost invariably the concrete is dumped from the street level to place through telescoping spouts or chutes. Occasionally where ramps into the subway cut have been installed, concrete trucks will be taken into the cut for paving the floor slabs.

Commercial concrete plants are finding many customers on subway contracts. Both ready-mixed and transit-mixed concrete are obtained from this source. For transit-mixed concrete the specifications require that the mixing be done after the truck reaches the job, and under the eyes of an inspector.

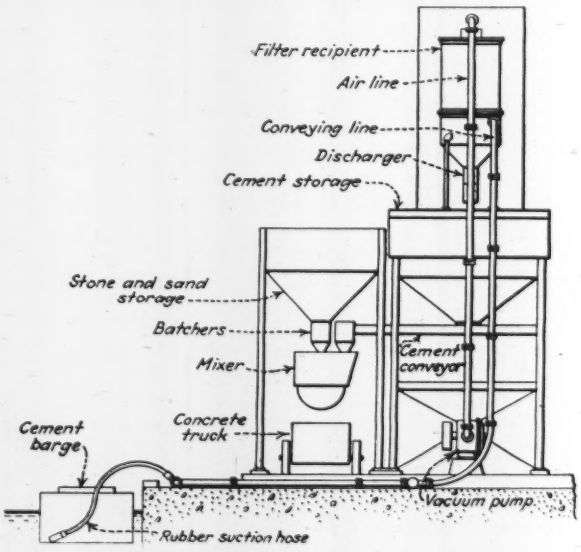


Fig. 8—Central concrete plant of the Carleton Co., located on a Brooklyn wharf

All materials are delivered by barges. Bulk cement is unloaded from barges by a vacuum system. Agitator trucks transport mixed concrete to the job.

Central plants owned and operated by the contractor are found on many jobs. These are usually located in a near-by vacant lot. The Carleton Co., having three adjoining sections of the Fulton St. route in Brooklyn, located the central plant on an East River wharf some distance away, in order to take advantage of water delivery of aggregates and cement. The Underpinning & Foundation Co., on a Fulton St., Manhattan, contract, was forced to locate its central plant in a corner of St. Paul's churchyard. Several types of central plants will be described.

Many of the central plants are ingeniously equipped and arranged for economical and speedy operation. The Carleton Co.'s Brooklyn plant uses bulk cement unloaded from barges by a vacuum system. No manual labor is involved in unloading the cement, except that of one man handling the suction nozzle in the boat. The cement is carried through a pipe to a storage bin at the top of the plant. Aggregates are unloaded from barges directly into storage bins on top of the plant by a stiff-leg derrick and clamshell. This contractor uses a fleet of agitator-body trucks to transport mixed concrete from the plant to the job. A layout of the plant is shown in Fig. 8.

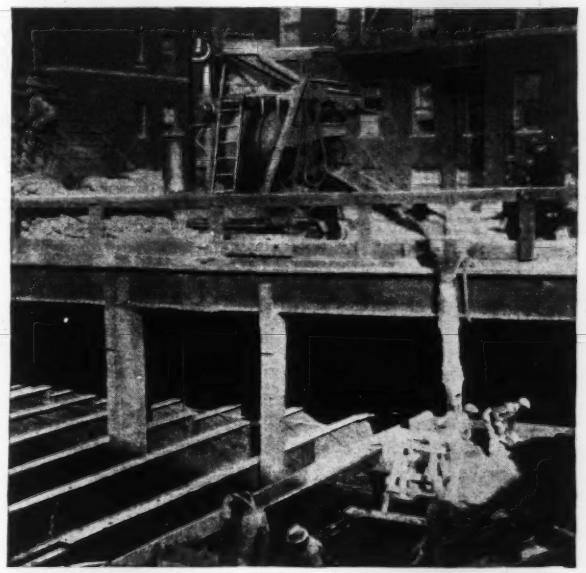


Fig. 9—Paving mixers are found on several subway contracts

Because of cramped space a compact plant was necessary for the Underpinning & Foundation Co.'s contract. Sand and gravel are dumped from trucks into separate bins set below ground level. A chain-bucket elevator then hoists the aggregates to storage bins at the top of the plant. Cement is hoisted by another similar elevator. A weighing batcher charges a 1-yd. electric-drive mixer. Mixed concrete is dumped into special 1-yd. dump trucks at street level for transportation to the job.

Rodgers & Hagerty, Inc., on one of its Brooklyn contracts, located the central plant on a lot large enough to use a stiff-leg derrick for charging a 150-ton storage bin. Aggregate trucks dumped onto storage piles from a timber ramp. Cement in bags was stored at ground level and hoisted to the mixer platform by a tower elevator. Aggregates were batched by the inundator system and then discharged into a 1-yd. electric-drive mixer. Regular dump trucks distributed the concrete. Steam from two 40-hp. boilers heated aggregates and water in cold weather.

Two underground concrete plants deserve mention. The Arthur A. Johnson Co., on its Queens Boulevard section in Queens Borough, uses a plant placed entirely under ground except for a cement storage shed at street level. The plant is located in a sheeted shaft sunk for that special purpose. Cement in bags is chuted to the mixer room. Aggregates are dumped from trucks into storage bins set below street level. From the storage bin the aggregates flow by gravity through an inundator, which, in turn, discharges into the 1-yd. mixer below. Mixed concrete is hoisted in buckets to trucks at street level. The trucks are fitted with special 1-yd. hopper bodies.

Hart & Early, Inc., used a somewhat similar plant in Brooklyn. Fig. 7 shows details of this plant.

Another type of concrete plant used on subway work is the portable mixer, moved around the job as needed. These are usually of the paver type, charged by truck delivery of aggregates. Some of the contractors have central batching plants of their own. Other buy the material batched from sand and gravel companies.

Quantities

Of the new city independent subway system, consisting of 55 route miles, all the main structural work is under contract or has been completed, except the Sixth Ave. line in Manhattan. Excluding station finish and track work, both requiring a considerable amount of concrete, the work under contract or completed amounts to 660,000 tons of structural steel and 3,500,000 cu.yd. of concrete.

Personnel

The Board of Transportation of the City of New York has charge of the design and construction of subways. John H. Delaney is chairman of the board. Robert Ridgway is chief engineer, John R. Slattery is deputy chief engineer in charge of construction, A. I. Raisman is chief designing engineer, and H. N. Latey chief electrical engineer.

Pipe-Line Corrosion in Ohio

Recognition of the fact that soils differ widely in their corrosive effect upon underground pipe lines has led to investigations by the U. S. Bureau of Standards for the purpose of identifying the corrosive soils and indicating their distribution. Most of this work has centered in the West and Southwest. However, the rapid expansion of natural-gas lines eastward has called attention to the need of more definite information on the corrosiveness of Eastern soils, which differ greatly from those of the West. During 1929-30 a study of soil corrosion was made on a group of oil lines in Ohio, the results of which are discussed in the October, 1931, issue of the bureau's *Journal of Research*. Certain well-defined soil types were found to occupy the corrosive areas. Determination of the acidity of samples taken at various points along the lines showed that the corrosive soils were very acid and that the degree of acidity might be taken as a rough measure of their relative corrosiveness. A second test was made by measuring the extent to which a thin steel disk was corroded by moist soil in the laboratory, and the results in general agreed with the previous acidity tests.

Low-Cost Paving With Gravel Asphalt Mixed at the Pit

Portable asphalt plant at local pit produces gravel-asphalt surfacing at cost of $3 a ton in place and ready for traffic

By W. McK. WHITE
President, Chausse Oil Burner Co., Elkhart, Ind.

ASPHALTIC GRAVEL offers a finished hard pavement at a cost of about $5,000 per mile. It consists of bank-run aggregate, screened to remove stone over ¾ in., mixed with a proper percentage of bitumen. It is laid either hot or cold, depending upon the kind of asphaltic oil employed. It is mixed in the gravel pit, eliminating haulage of raw material and involving only the usual transportation of finished mix.

Macomb County, Mich., was one of the first to try out asphaltic gravel, under the direction of County Engineer McKinney, and it has successfully covered a large mileage of county highways. This county has several gravel pits from which to provide the materials. Most recently Claude B. Talbot, a contractor of Detroit, is paving approximately 50,000 sq.yd. of city streets in the village of Rochester, Mich. This is a town of about 5,000 population, 26 miles northeast of Detroit. Most of its streets were graveled over natural earth and had become solidly compacted by traffic. The main street had been paved with concrete, being a state route to north Michigan points, and one or two state route feeders were paved. Each year the village expended considerable sums for chloride and other dust layers. Because of a good gravel producer adjacent to the town and the success of the adjoining county with asphaltic-gravel pavements, the village council decided to pave most of the main residential streets during this past summer. The contract was let to Mr. Talbot.

The preliminary work included regrading the streets to remove surplus dirt or gravel, provision for drainage at intersections and proper regard for present or future curbs, all to allow for a top coat of asphaltic gravel 3 in. thick loose and 2½ in. when compacted by roller. The streets were opened to traffic a couple of hours after rolling.

Gravel was obtained from the pit of John G. Kemler, 3 miles from the town. No special processing was necessary. Carried by belt conveyor from the bank to the top of the bins, it passed through screens to exclude stone over ¾ in., but it was not washed. It contained normal moisture, not over 5 per cent, and was fed directly into the contractor's portable heating and mixing plant. Kemler's subcontract included hauling the hot mix, in steel-body dump trucks, 3 miles to Rochester. These bodies were kept oiled to prevent sticking, and the loads were covered with canvas en route to retain heat.

A particular and essential feature of Talbot's equipment was his portable premixing asphalt plant, which consists of two units, both mounted on steel wheels with solid rubber tires. One unit is the drier. Aggregate from the pit bin feeds directly into a large hopper, from which it passes into the rotating sand drier. It is thoroughly dried, heated to about 300 deg. F and discharged into an elevator attached to the other unit. The elevator raises the heated aggregate and discharges into a measuring device and thence into a continuous-blade-type pug mixer. At the same time the bitumen, which is being heated in the 950-gal. tank, is pumped into a measuring device connected to the aggregate measure. The bitumen measure is adjustable, so that any amount up to 10 per cent can be admitted into the pug mixer. For the Rochester job about 5 to 6 per cent bitumen was used. From the pug mill the hot stuff is dropped into the storage bin, which has a movable bottom gate operated by the truck driver. The contractor's force consisted of one foreman, two plant operators, four shovelers and rakers, one man setting forms, etc., one roller operator, one driver with tank truck to carry asphalt from car to plant, one fireman for tank-car heater and two watchmen. In addition, Kemler employed three to four men driving trucks and one to two men operating the gravel supply.

The total operating cost was about $3 per ton, completely laid and rolled. This includes all material and labor, interest and depreciation on equipment. It further figures, with ample margins, a cost for a 20-ft. roadway complete—about $1,500 per mile per inch compacted thickness. The haul of 3 miles showed practically no loss of heat, and it is felt that a haul of 15 to 18 miles is entirely feasible. The material was laid at an average temperature of 275 deg. F.

Street paving at Rochester, Mich., with gravel asphalt mixed at local pit

Reconstructing a Dynamited Bridge

By PAUL EMERY
Office Engineer, Kansas City Bridge Co., Kansas City, Mo.

Wrecked structure at Garland City, Ark., required new 300-ft. center span, which was erected without falsework, and new end post and floor beams in adjacent spans

DURING the night of Sept. 3, 1930, an explosion of dynamite that had been placed on two piers of a new bridge just completed over the Red River at Garland City, Ark., by opponents to the bridge destroyed the center 300-ft. span and damaged the adjoining 300-ft. spans (*ENR*, Sept. 11, 1930, p. 431). The contractor immediately began reconstruction of the wrecked structure, and the novel means employed are described in the following article. —EDITOR.

REBUILDING of the state highway bridge over the Red River at Garland City, Ark., after the center 300-ft. span had been dropped into the river by dynamite exploded on the piers, involved some interesting erection procedure. An entirely new span was built by erecting two halves as cantilevers, utilizing some members of the wrecked span for temporary erection pieces, and some new members were inserted in the two adjacent spans, which were rather seriously damaged.

The bridge consists of three 300-ft. through riveted truss spans and concrete-girder approaches. The roadway width is 20 ft. between curbs, and the trusses are 24 ft. center to center. The steel in each 300-ft. span weighs 346 tons, and the concrete floor weighs 364 tons, making a total dead weight per span of 710 tons. The explosion threw the center span into the river. Damage to the east-end span at pier 3 was confined to the downstream truss. The concrete pier coping was badly shattered under this truss, and the cast-steel shoe was wrecked, allowing the truss to drop down onto the shattered pier top. The end post was badly bent, the lower chord was ruptured near the shoe and the end floor beam was badly damaged. On the west-end span on pier 2, both cast-steel shoes were badly damaged, and the gusset plates at L_0 were ruptured and blown off the pins, allowing the span to settle several inches. This end of the span was held off of the pier by the damaged shoes and was balanced in a very precarious manner, as shown in Fig. 3. The end floorbeam was damaged also, and the concrete pier coping was badly shattered.

It was decided to salvage parts of the wrecked span in the river for use as temporary material in rebuilding the bridge. With this in mind, all the exposed steel of the old span was burned off near the water edge and dragged up onto the river bank, care being taken to save long straight pieces of the top and bottom chords and some straight sections of diagonals. A few stringers and sections of floorbeams were saved to use as cribbing for jacking.

East Span Repairs—The east span was repaired first. A timber tower bent was built under the L_2 point of the downstream truss to support the 225-ton hydraulic jack used for raising and holding this truss while repairs were being made. The reaction at this point was 208 tons, and the stresses during this operation were all well under the design stresses except in two members. The vertical L_2U_2 had a unit stress of 16,200 lb. per sq.in. in compression and, being rather slender, was braced to the M_3 point. The diagonal U_2L_4 had a unit stress of 23,800 lb. per sq.in. in tension.

The span was carried on the jack while the new end post and new shoes were placed, the lower chord spliced out with a new portion near L_0, and a new end floor beam placed. The damaged concrete in the pier top was then repaired and the span lowered onto the pier.

West Span Repairs—The repairs to the west span had to be made carefully due to its shaky condition on the pier. A jacking bent of salvaged top-chord sections was built in the field and placed on a web wall 7 ft. wide near the base of the pier. This bent extended to points on the lower chords about 5 ft. out from L_0. Temporary struts consisting of 12-in. 102-lb. sections were framed into the end posts at the points where the collision struts connected and were connected to the lower chords over the jacking bent, thereby forming a temperary end post. Hydraulic jacks of 225-ton capacity, one under each truss, were used to raise this span to its proper elevation. The calculated reaction was 180 tons for each jack. The span was carried on these jacks while new gussets and shoes were placed at L_0, a new end floorbeam installed and the damaged pier top repaired.

New Center Span—Because of the danger incident to placing falsework in the Red River during a large part of the year, it was decided to erect the new center span by cantilevering out half-way from each of the two end spans and making the closure in the middle. The tiebacks were made from salvaged lower-chord sections from the old center span. Pin plates were fitted to them in the field. Portions of the coverplates at the U_1 points of the end spans were burned away, so that pin plates for the tiebacks could be riveted to the gussets at those points. Simliar

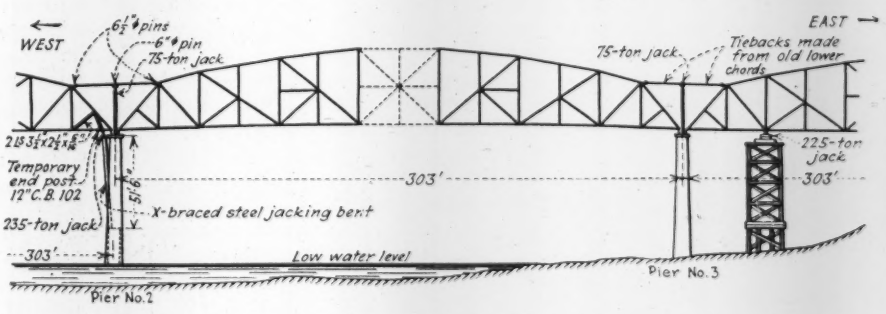


Fig. 1—Erection diagram for repairing end panels of side spans and erecting new center span for Red River bridge at Garland City, Ark., wrecked by malicious dynamiting

provision for connecting the tiebacks was made at the U_1 points of the new center span. The tiebacks were pinned in the middle, and a jacking strut placed at that point, which provided a vertical adjustment for the cantilever arms when closing.

Some of the unit stresses due to this method of erection were high. The unit stress in L_0L_2 of the cantilever arms amounted to 17,000 lb. per sq.in. in compression. In diagonals U_1L_2 of the end spans this stress amounted to 25,000 lb. per sq.in., and in U_2L_4 amounted to 24,400 lb. per sq.in. Stresses in the other members were all less than the design stresses. Total stress in each tieback when horizontal was 711,000 lb.

Cast-steel wedges were provided at the L_0 point of the east cantilever arm, the expansion end of the center span. These wedges sloped 2 in. in 12 and allowed a total horizontal movement of 3 in. for the east cantilever arm. As a thrust of 711,000 lb. made it difficult to build economical wedges that could be driven, these wedges were designed only to be pulled—hence the steep slope. A holdback was provided so that the wedge movement was easily controlled, allowing no chance of its being removed too rapidly. The guide castings for the wedges took bearing against the center span, allowing free movement of the cantilever arm in a vertical arc.

The thrust at L_0 of the west arm was taken by steel castings framed into extensions of the gusset plates at that point. No provision was made at this point for horizontal adjustment, the only adjustment for the west arm being vertical, as provided for by the tiebacks.

The east arm was erected first. Erection was started with the wedges all the way in and the tiebacks horizontal or all the way out. On the completion of this arm it was found that its outer end, the L_6 point, was about 6 in. above camber elevation and about 1½ in. too far out horizontally. In order to provide slack in the tiebacks of this arm for ease in removal after closing, the center points of the tiebacks were jacked up several inches, which of course raised the L_6 points of the cantilever slightly higher.

Fig. 2—Erecting a 300-ft. truss by cantilever method
Timber falsework under side span supported a 225-ton jack which carried span while new end post and new shoes were installed.

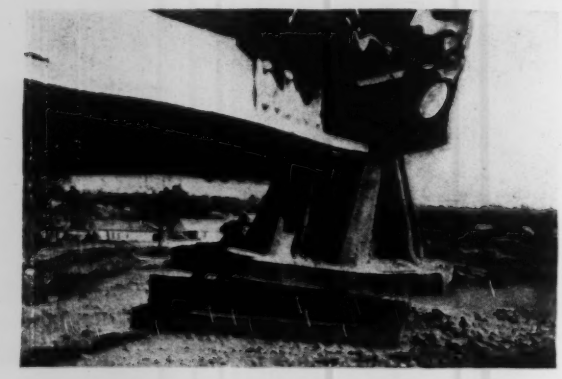


Fig. 3—Damaged shoe balanced west-end span in dangerous position

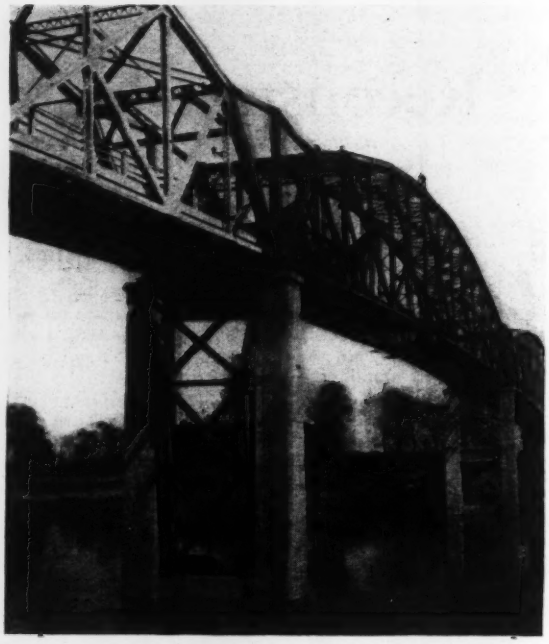


Fig. 4—Closing cantilever arms of new center span
Note raised position of tiebacks, providing slack for lowering west arm to effect closure. Also jacking bent that carried side span while new shoes and a new end floorbeam were installed.

Based on the actual deflection observed in erecting the east arm, the tiebacks of the west arm were placed so as to bring the L_6 point of this arm to about the same elevation as L_6 of the east arm.

When ready to close, the space between the two arms was about 1½ in. too short. The wedges were let out enough to reduce this about ⅝ in., and the L_6 points were brought to the same elevation, which was about 5 in. above camber elevation. The closing lower chord sections were brought out and a few bolts put in one end with the other end left loose. This was in the evening, and by morning the steel had contracted enough so that these lower chord sections could be completely bolted up without further movement of the wedges. The diagonals for the closing panels were then placed and bolted only at the lower end. As the top chords were placed, the tiebacks were lowered, bringing the holes in the top-chord splices into position. After bolting up and partly riveting these connections, the span was swung by letting off the tiebacks completely and withdrawing the wedges.

The contractor for both the original and for the repair work was the Kansas City Bridge Co., of Kansas City, Mo. Designs for the repairs and for the cantilever erection were prepared by the writer under the direction of O. A. Zimmerman, chief engineer of the company. Charles S. Tupper had charge of erection. Ira G. Hedrick was consulting engineer for the State of Arkansas for the bridge and was represented in the field by E. B. Stokes as resident engineer.

Storm-Relief Sewer Details, Dayton, Ohio

Flat-top sections necessitated in places by shallow cover and underground obstructions—Invert lined for high velocity—Pressure manholes and junction chambers—Design factors

By GEORGE R. BARTE
Memphis, Tenn. (Formerly Assistant City Engineer of Dayton)
and R. E. VAN HORN
Assistant City Engineer, Dayton, Ohio

UNUSUAL cross-sections, junction and reducing chambers, a siphon and bolted manholes to resist internal pressure are some notable features in the design of the Findlay St. storm sewer built at Dayton, Ohio, to divert to the Mad River the flow of certain sewers that formerly discharged into the Miami & Erie canal. With this old and abandoned canal filled in and its lands used for railway grade-separation (*ENR*, Sept. 17, p. 449), there no longer existed any outlet for stormwater from the Dayton hydraulic canal, which extends from the eastern city limits along Springfield St., about a mile south of the Miami & Erie canal, and discharges into the latter at Front St. The new storm-relief sewer was provided, therefore, to intercept a series of sewers that formerly discharged into the hydraulic canal, the sewers serving a tributary drainage area of 670 acres south of Springfield St. and having a runoff of 577 sec.-ft.

Right-of-way conditions governed the selection of the Findlay St. route, since other routes would have required expensive location through industrial plants, while a possible location farther east would have had too high an outlet because of a dam in the Mad River that impounds water to supply the wells of the city water-supply system. The interceptor starts at Winston Rd. with a diameter of 48 in. and follows the hydraulic canal bed and Findlay St., increasing to 84-in. diameter or equivalent flat-top sections from Springfield St. to the Mad River outlet. At First and Findlay Sts. it is joined by a 48-in. branch bringing in stormflow from the west. It is of monolithic-concrete construction, with invert liner plates of vitrified clay.

Special Sections—Elevations of the sewer at various points were determined by the water level of Mad River, the street grades and the elevations of various underground structures. In general the sewer is of circular section, but the flat grade on Findlay St., in connection with the shallow cover and other conditions, made flat-top sections necessary at several points. A typical section of this kind is shown at *A* in Fig. 2, a somewhat heavier construction being used in passing under a street-car line. Where the circular sewer passed under railroad tracks, a flat base (shown at *C*, Fig. 2) was used to strengthen the barrel of the sewer and prevent settlement, in view of the vibration and excess loading resulting from the passage of heavy trains.

On the mud flat encountered after crossing south of the canal from Jersey St. to Winston Ave., it had been decided previously to provide for a future boulevard over the sewer, and a redesign of the street layout in the area was found necessary. Grades for cross-streets were adjusted to fit conditions, due to changes in grade of the street layout. The considerations of minimum street grade made it necessary to bring the flow lines of the connecting sewers into the trunk sewer at various depths. On account of the proposed 10-ft. widening of Findlay St. and the insufficient cover to permit of an 84-in. circular section, a flat-top section of the required capacity was provided (Figs. 2 and 4).

Fig. 1—Sewer outlet at Mad River
Levee in rear. Note slopes paved with flexible revetment of concrete blocks.

Water-Main Crossing—Near the Mad River levee the path of the sewer was partly blocked by an 84-in. precast concrete water line, which supplies the city of Dayton with water. This line was under 25 lb. pressure and was a very serious problem, since any mishap would affect the city's water supply. In passing this obstruction the grade of flow line of the sewer was kept to 0.07 per cent, the same as in the adjacent 84-in. circular sewer section, but the top was drawn down from 84- to 38-in. interior height, the horizontal dimension being proportionately increased (Fig. 3) in order to reduce head losses.

In construction, the middle part of the depressed section was poured first, starting with the piers or sides, which formed supports for the barrel of the water conduit. Several cable slings attached to a 24-in. I-beam over the center of the conduit supported this structure while earth was excavated between the piers and the forms and reinforcing were placed. The invert was poured first and finally the flat roof. Later, the sides of the water conduit were packed with 1:9 concrete over the storm sewer, forming a cradle, as shown.

Junctions and Reducing Chambers—A number of junctions for lateral sewers were required, as well as reducing chambers at changes in dimensions. At the connection of the 48-in. branch with the flat-top main sewer at First and Findlay Sts. a complicated junction chamber was introduced to eliminate head losses. This is shown in Fig. 2. At More Ave. a 48-in. branch enters a reducing chamber in which the main sewer changes from 60 to 72 in. in diameter in a length of 35 ft. This combined junction and reducing chamber is shown in Fig. 6, together with a simple reducing chamber where the diameter is changed from 48 to 84 in.

Sewer Design—The complete structure was designed for a loading of 20-ton trucks, increased by impact,

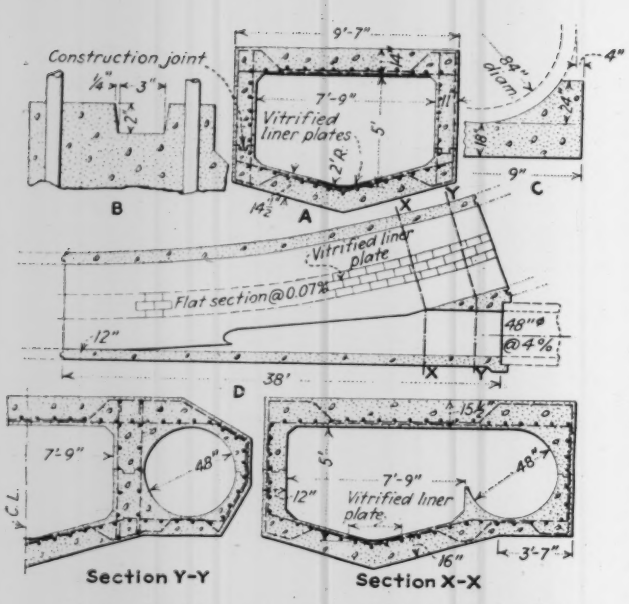


Fig. 2—Special sewer sections and junction chamber

A, typical flat-top section; *B*, construction joint; *C*, sewer base under railroad; *D*, junction of circular and flat-top sewer at First and Findlay Sts.

earth load and other conditions producing maximum stresses. Impact varied with amount of cover, type of soil and span of structure. Other factors included a static head of 26.5 ft., internal pressure and a velocity of 17.8 sec.-ft. in the 84-in. sewer, which made it necessary to use the vitrified-clay invert lining mentioned above. Cuts ranged mainly from 8 to 28 ft. to the invert grade.

All interior surfaces of junction chambers and sewer sections were designed and constructed so as to eliminate as far as possible all of the head losses due to friction, entrance, curves or bend and also due to turbulence. The sewers to be connected to the interceptor were from 20 to 30 ft. above the interceptor, and therefore caused high entrance velocity and were subject to much abrasion. As this brought about high velocity in the connecting sewer, it permitted the use of smaller and more economical sections. This is especially apparent in More Ave., where a 48-in. sewer at 2.44 per cent grade and 169 ft. long connects an old 84-in. sewer at 0.08 per cent to the interceptor (Fig. 6) at a chamber in which the latter is increased from 60- to 84-in. diameter and has a grade of 0.56 per cent.

Wherever the calculated velocity exceeded 7 ft. per second, three rows of 10-in. vitrified liner plates were used in the invert, and were laid in a slot or groove. As soon as possible after forms were removed, these liner plates were grouted with soft 1:3 mortar and then swept with the same mortar, filling all voids and joints so as to make a smooth flow line.

At the upper end of the Findlay St. flat-top section, where the 84-in. section enters it, a 4-in. metal pipe was inserted into the top of the sewer and carried to the free air above, ending in an elbow at sufficient height above the crown of the sewer to care for the 26.5 ft. static head of water in the sewer. This pipe was designed to relieve the sewer barrel of the internal vacuum caused by a change of flow from gravity to pressure type—that is, when the discharge exceeds that of a gravity sewer due to the pressure built up within it.

Sewer Siphon—At the intersection of Findlay and First Sts. it was necessary to carry a sanitary relief sewer under both the main line and branch of the storm sewer by means of a 30-in. inverted siphon, connecting a 39- with a 48-in. pipe section (Fig. 4). The mean calculated velocity in the siphon was 6.7 sec.-ft. Construction was facilitated by bypassing the sewage to a conveniently located 30-in. storm sewer. A 24-in. flap valve was installed to bypass through this 24-in. connection in order to permit of cleaning the siphon should stoppage or other trouble occur. Slots were also provided in the inlet and discharge ends of the siphon for stoplogs to hold back the sewage and permit pumping the siphon dry, since this may require examination or repair more often than the other sections of the sewer.

Pressure Manholes—Manholes of special type were required, in order to resist internal pressure and also to provide for entrance at street grade. Their typical construction is shown in Fig. 5. The street casting is large enough to permit the removal of the pressure manhole cover, which is located at the barrel of the sewer. This cover is bolted down and sealed with gaskets to insure a watertight joint. The bolts were brazed to the body of the casting, only the nuts that secured the plate being free to move.

The outfall chamber at the Mad River (Fig. 1) is an open flaring channel, designed to reduce the velocity of the sewer flow from 18—17.8 sec.-ft. to about 2 or 3 sec.-ft., thus preventing scour where the sewer flow

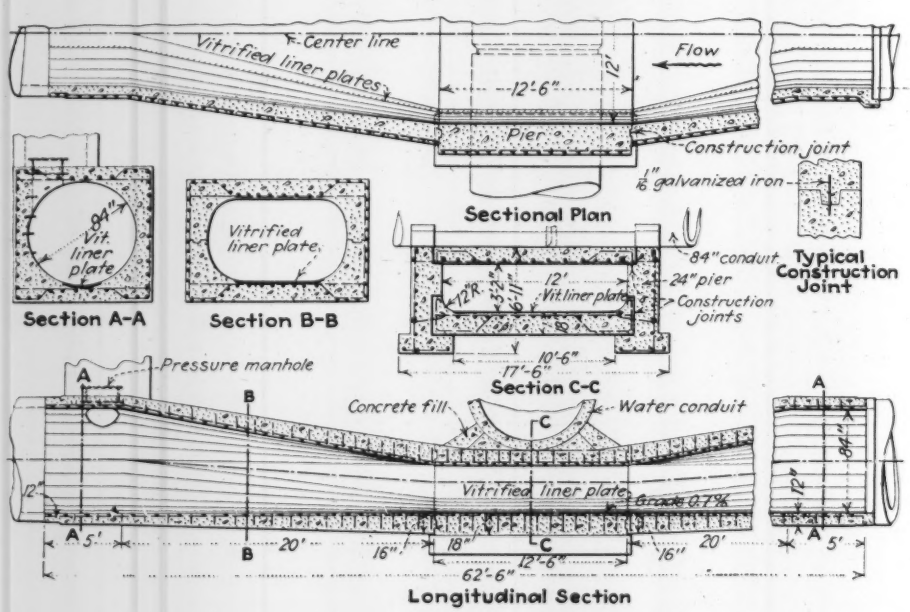


Fig. 3—Sewer carried under 7-ft. water conduit

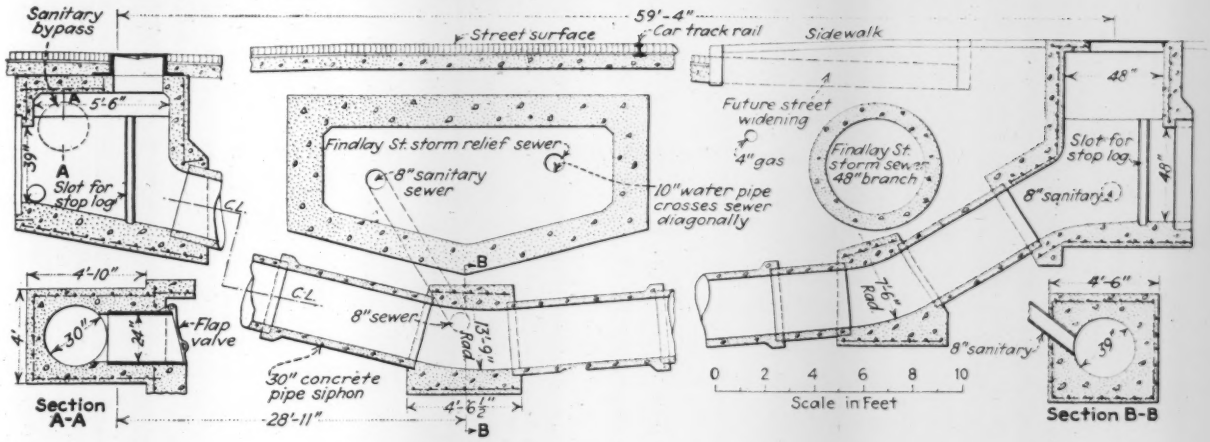


Fig. 4—Reducing and junction chambers

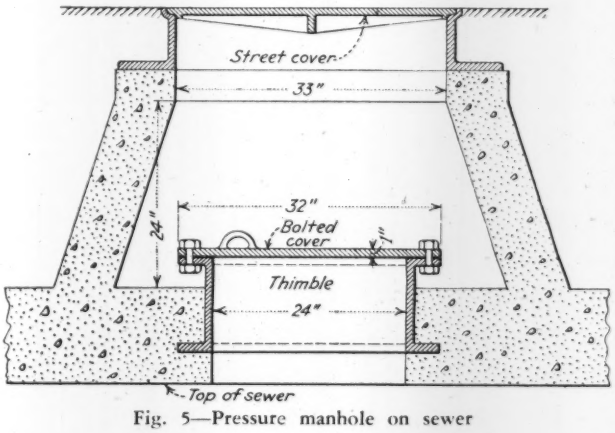


Fig. 5—Pressure manhole on sewer

merges with the river. Its invert is lined with vitrified-clay plates.

Cost and Contracts—Bids were taken on precast pipe and monolithic concrete sewer, and the work was divided into four sections to give smaller contractors an opportunity to compete with the larger firms. The low bids are given in the accompanying table. Since the bid on monolithic construction was $20,000 lower than that for precast construction, it was decided to adopt the former. Boyd & Cook, of Dayton, were low bidders on three sections and were awarded the contract for these. For the first section the award was made to the United Construction Co., of Cleveland, but as that company did not desire to move its equipment and machinery to Dayton for the work involved on only one section, it assigned this contract to Boyd & Cook at the lower bid price of the company.

Work was started about May 16, 1930, with two shifts, and was completed on Nov. 18, consuming 196 working days of the total time-bid of 210 days. The project was planned and executed under the direction of John F. Hale, city engineer, Dayton, Ohio. The plans, specifications, design and surveys were under the supervision of R. E. Van Horn, assistant city engineer in charge of design in the bureau of sewers, under W. E. Macy, engineer of sewers.

LOW BIDS ON FINDLAY ST. SEWER

Section	Precast	Monolithic	Bidders
1	$101,111	$97,179	United Construction Co.
2	80,293	69,934	Boyd & Cook
3	22,953	18,185	do.
4	16,376	15,126	do.
Total	$220,733	$200,424	

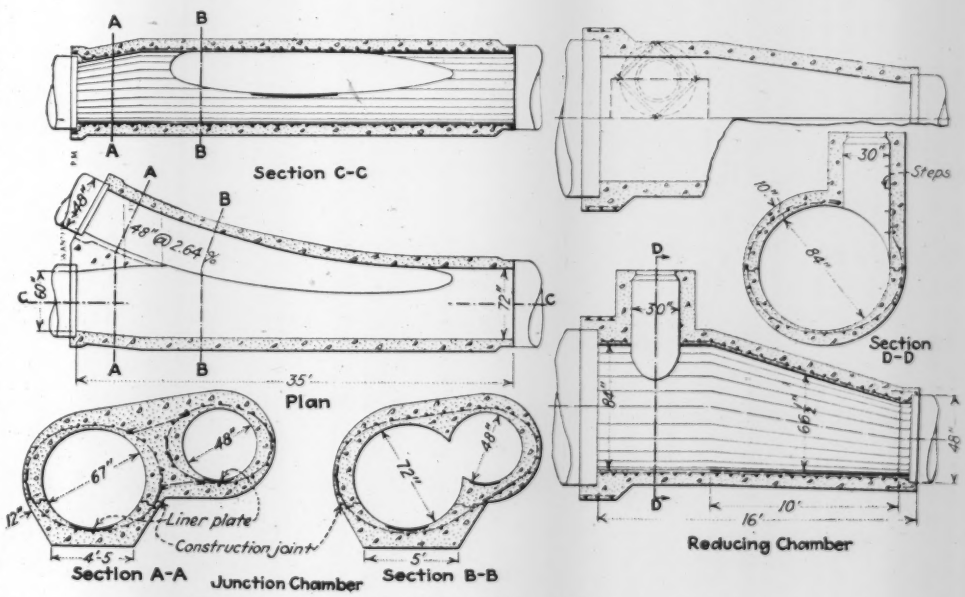


Fig. 6—Reducing and junction chambers

FROM JOB AND OFFICE

Hints That Cut Cost and Time for the Contractor and Engineer

Strengthening a Stone Arch

IN AN OLD masonry arch carrying a low-level street under the bridge approach of a main street at Exeter, England, a crack was found to be developing along the underside. Repair work was a difficult problem owing to the heavy traffic (including street-cars) on the high-level street. The method was described briefly by R. H. Dymond, city engineer, at a meeting of the Institution of Municipal and County Engineers.

When the top of the arch was bared over the line of the crack the masonry was found to be in bad condition, the stones varying in thickness from 6 to 18 in. and being jointed in lime mortar that had deteriorated considerably. The whole arch was coming apart from one abutment to the other, while the adjacent retaining wall on one side was 6 in. out of perpendicular. This wall was at once braced with three masonry abutments, designed to conform with the architecture of the bridge.

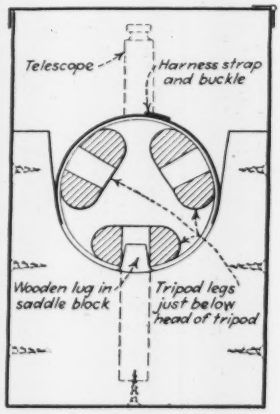
Then the spandrel walls were tied together just above the arch ring by six 2-in. tierods passing through 3-ft. lengths of 12-in. channels and secured by nuts on the threaded ends. These channels, which had a bearing against the arch ring and the spandrel wall, were concealed by a concrete cornice cast in place. As the work had to be carried out in two sections, the tierods were hooked together on the center line. After the top of the old arch ring had been cleaned and grouted, it was relieved from pressure by a bed of lean concrete, 9 to 18 in. thick, extending over it and carried into the abutments. Above this was 6 in. of hard filling and then a 9-in. deck slab of reinforced concrete.

Automobile Carries Surveying Equipment

By T. A. SMITH
Van Buren County Surveyor, Paw Paw, Mich.

DURING the last four years the writer has used a very handy and satisfactory method of carrying a transit and range poles on an automobile. The accompanying illustration shows the type of box used and the method of attaching it to the car. Another box on the opposite running board holds a level rod, axe and iron monuments. Wooden stakes are carried in the rear trunk.

Transit box mounted on automobile



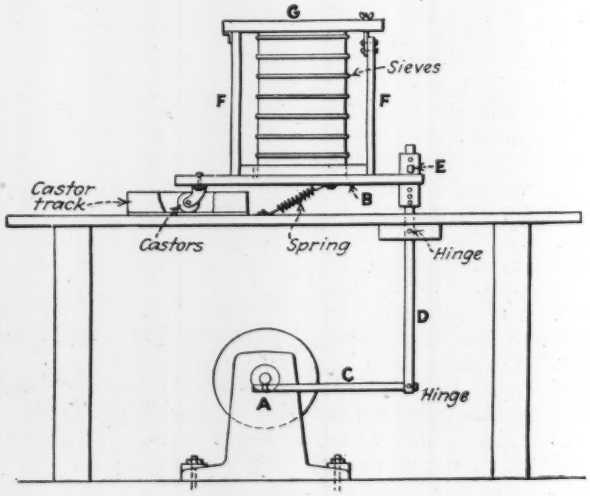
Section showing saddle block

The drawing shows how the transit is supported in the box. A leg of the tripod fits over a lug in the saddle block in such a way that when the tripod is strapped in, as shown, it cannot bounce up and down, nor can it slide endwise. The transit head is left on the tripod at all times. With this method of carrying there is no more trouble keeping the instrument in adjustment than when it is carried in the usual way. It requires less than ten seconds to place the transit in the box ready to move to the next set-up. The only difficulty that has arisen is that, to those not knowing what it is, the box suggests a machine gun mounted on the car.

Shaker for Sieving Sand or Cement

By MELVIN L. HUGHES
Turner Construction Co., New York City

THE cheap home-made device shown in the accompanying illustration has been extensively used in the laboratories of the Turner Construction Co. for sieving both cement and sand. It can be operated by an individual motor or from a countershaft used for running other machinery. An eccentric *A* gives a reciprocating motion to the platform *B* through levers *C* and *D*. Hinges are made of two pieces of angle iron transversed by a pin. Several holes for hinge *E* permit the length



Home-made sieve shaker

of stroke to be varied. The platform *B* is made of boards with two furniture casters for rollers. Short pieces of angle iron fastened to the table serve as roller guides. On top of the platform is nailed a board with a round hole cut in it to receive the set of sieves, which is clamped in place by two uprights with a hinged top piece fastened by a bolt and thumb screw. A tapper can be added to this machine by suspending a weight from the top of the frame between one of the upright pieces at the sieves. As the machine moves backward and forward, the swinging weight taps both frame and sieve.

Masonry Wall Masks Steel Standpipe

TO PROVIDE additional high-level water storage without imposing an esthetic handicap upon a residential section, the village of Scarsdale, N. Y., has lately completed a 1,700,000-gal. masonry-inclosed steel standpipe so pleasing in architectural appearance that it is an asset, rather than a liability, to the neighborhood.

Scarsdale is a residential suburb of New York City, with a 1930 population of 9,690 and no industrial development. Its water, purchased from the Pocantico Water Co., enters the village at the east, where a 750,000-gal. steel standpipe floats on the line, and is carried to the west side by a 16-in. main. The water level in the standpipe is maintained by three centrifugal pumps controlled by automatic pressure switches. At the peak rate of consumption the old standpipe had a capacity equivalent to two days' supply only. In addition, the draft at certain times approached three times the capacity of the pumping station, and the heavy flow through 3 miles of 16-in. main at such periods resulted in large pressure losses. Accordingly, the construction of a new standpipe was decided upon some time ago. The logical location for this new unit was on the high ground at the west end of the 16-in. main, where, because of the high value of the neighborhood and its use for residential purposes, it was decided to mask the new standpipe in masonry.

Masonry-inclosed steel standpipe of unusual esthetic appeal

As constructed, the steel tank is 54 ft. in diameter and 101 ft. high. It is of conventional riveted construction, with an exterior coating of aluminum graphite. Surrounding the tank, at a clear distance of 4 ft., a wall 4 ft. thick at the base has been constructed of native masonry trimmed with Maine granite. An unusual feature is the use of circular rings or hoops of reinforced concrete, extending around the entire circumference of the inclosure at intervals throughout the height of the structure. The roof, of steel plates supported by flat trusses, spans both standpipe and wall. Between them there is a curved stairway extending from ground level to the roof.

In addition to being connected to the present 16-in. service main, the new standpipe will also be provided in the near future with an auxiliary water supply pumped from an aqueduct of the New York City water system passing through the Bronx Valley. At the aqueduct take-off a meter and pumping station will be constructed in the graded ramp approach to a highway bridge. This expedient will make it unnecessary to erect a pumping station within the confines of the Bronx River Parkway, a highly developed traffic artery maintained by Westchester County.

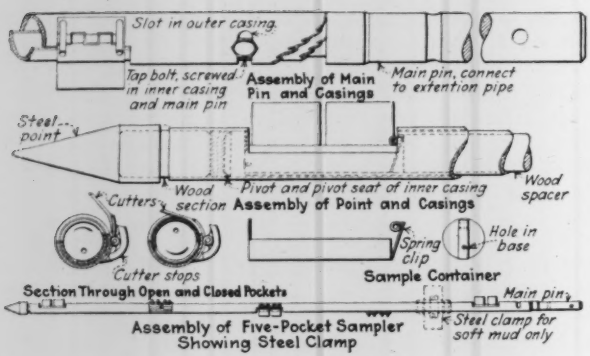
The total cost of the new 1,700,000-gal. standpipe was $135,000, of which $44,000 was used for the inner steel-tank erection. Sanborn & Bogert, New York City, acted as consulting engineers, and the Petroleum Iron Works as contractor. Arthur Boniface is village engineer of Scarsdale, and Franklin Henshaw is superintendent of the waterworks.

Device Secures Accurate Samples From Subaqueous Silt Beds

By R. W. ELLMS
Philadelphia, Pa.

SINCE the completion of the Holtwood dam of the Pennsylvania Water & Power Co., on the Susquehanna River, an enormous quantity of coal-laden silt has been deposited in the lake above the dam. Beds extend for a mile along the stream, in some places to a depth of 60 ft. The coal, originating in culm piles and mine outcroppings, is washed into the river, carried downstream and deposited in the slack water above the dam in beds that also contain fine sand, mud and gravel.

In studying the problem of coal removal from the silt deposits, the power company wished to determine the percentage of coal that might be economically recovered. The volume of silt was readily computed by comparing a topographical survey run over the tops of the beds with old maps showing the contour of the riverbed before the dam was built; but the problem of determining the relative amount of coal present was more difficult. Different beds contain widely varying proportions of coal, nor is any single bed of uniform composition throughout its


Slot in outer casing
Top bolt, screwed in inner casing and main pin
Assembly of Main Pin and Casings
Main pin, connect to extention pipe
Steel point
Wood section
Pivot and pivot seat of inner casing
Assembly of Point and Casings
Wood spacer
Cutters
Cutter stops
Section Through Open and Closed Pockets
Spring clip
Hole in base
Sample Container
Main pin
Steel clamp for soft mud only
Assembly of Five-Pocket Sampler Showing Steel Clamp

Construction of silt sampler

depth. It was necessary, therefore, to obtain a large number of samples widely distributed in both location and elevation.

Several methods of sampling with standard equipment were attempted, but with unsatisfactory results. In driving open pipes it was found that soft material would not be retained on withdrawal, while hard material would not force its way inside to the full depth of penetration. Thus the vertical location of samples was uncertain. An attempt to use a suction pump resulted in drawing up too great a proportion of the finer particles. These objections were finally eliminated by using the core sampler here illustrated, which was developed and patented by the author.

In its essentials this sampler consists of two seamless steel tubes or casings, one within the other. The inner tube is divided into a number of compartments by wooden spacers, and each pocket is fitted with a cup to facilitate removal of the sample. At the top of each compartment 180-deg. openings are cut through both tubes. When matched, these admit material to the pocket, while a 180-deg. rotation of one tube in respect to the other serves to close and seal the entrance. At the top of the device a bolt is screwed into the inner pipe through a horizontal slot extending halfway around the circumference of the outer. This serves as a stop at either the fully opened or fully closed position of the pocket entrance. Its removal permits dismantling the two pipes for cleaning. Other features of construction include pivoted flap plates at each compartment entrance, a fixed fin that can be clamped on the outer pipe to resist rotation in very soft material, a steel point at the bottom connected by a wooden section to facilitate replacement, and a main pin welded to the inner casing at the top for the connection of extra lengths of pipe extending above the surface of the water.

The length and diameter of the sampler and the size and spacing of the pockets can be varied to fit any conditions. At Holtwood two were used: one, 11 ft. long, for soft deposits; the other, 5 ft. long, for harder materials where considerable force was necessary to secure penetration. Both were made of 2- and 1½-in. tubing, with 5½-in. compartments spaced at 2-ft. intervals.

In making the survey a sampling scow with a 4-ft. square hole in the center was used. This was fitted with a hoist mounted over the hole, an outboard motor and three anchors. After securing the boat in position, a snatch-block was fastened to its deck and the hoist used to pull the sampler, with ports closed, to the desired depth. Then the top of the extension pipe was rotated in a counter-clockwise direction. The first half-turn opened the ports, after which the outer casing rotated with the inner and the pivoted flaps guided material into the several pockets. Two complete revolutions were usually sufficient to obtain adequate samples. A half-turn clockwise then sealed the ports, permitting the withdrawal of the sampler by the hoist.

Use of the device yielded true samples of material containing as much as 75 per cent water at definite locations without the necessity of sinking casings. It successfully penetrated 30 ft. of silt under 13 ft. of water. Results obtained under such difficult conditions suggest a variety of possible uses for the sampler in heterogeneous mixtures of granulated materials such as sand, flour and grain in bins, storage piles and railroad cars.

Mechanical Solution of Skew Angles

NINETY per cent saving in the time necessary to calculate angles used in detailing skew framing, such as hip-and-valley roof framing, bins, hoppers, towers and skew portals, is said to be possible by mechanical solution on a machine devised by Frank L. Martindale, structural engineer, Philadelphia, Pa. Results are given directly in terms of pitch in 12 in., as required for shop work.

The instrument is 18 in. high and weighs 60 lb. All eight variable angles between members with rectangular faces are shown simultaneously. Two central members can be positioned in any angle in space. These have scales showing horizontal, vertical and axial rotational positions. The machine, therefore, shows simultaneously fourteen space angles in their true relation.

For roof work one member is set for one roof pitch and the other for the pitch of the intersecting roof. The horizontal and vertical angle of the hip or valley, and the angles for purlin or jack rafter to valley on either side can then be read. In solving angles for bins and hoppers all three angles for one valley are read at one time. That is, the bevel for each side to the valley and the angle between sides at the valley are shown. The machine has the further advantage of giving a visual picture of a three-dimensional condition, and also measurements for clearance and cuts can be scaled directly from the machine.

Hip-and-valley machine

LETTERS TO THE EDITOR

Cement-Water Ratio by Weight Used Before

Sir—In the article by Inge Lyse entitled "Cement-Water Ratio by Weight Proposed for Designing Concrete Mixes" that appeared in *Engineering News-Record*, Nov. 5, 1931, p. 723, the author makes the statement that he does not know of anyone having previously proposed the use of the cement-water ratio by weight as a basis for concrete studies.

The use of the cement-water ratio by weight

$$\frac{\textit{Weight of cement, kilograms}}{\textit{Weight of water, kilograms}}$$

as an index of compressive strength and other properties of concrete was lucidly explained in a German engineering periodical more than four years ago. On March 18, 1927, Gaye, a German government supervising architect, read a paper before the 30th annual meeting of the German Concrete Association entitled "The Significance of Hardened Cement Paste in Poured Concrete" (Die Bedeutung des Zementsteins im Gussbeton), in which the cement-water ratio by weight is used in much the same manner as the water-cement ratio by volume is being used so extensively in the United States for designing concrete mixes. Gaye's paper was published in the German periodical *Beton und Eisen*, Vol. 26 (1927), pp. 237-244, 270-273.

The main objection to the cement-water ratio by weight is perhaps its abstractness. It is something apart from bags of cement and gallons of water. It does not have the definiteness and concreteness of the method employing familiar units of measure so generally associated with concrete work. It is much easier to visualize gallons of water and sacks of cement than pounds of water and pounds of cement.

The accompanying table has been prepared primarily to show the relationship between the water-cement ratio by volume either as gallons per sack of cement or as cubic feet of water per cubic foot (one bag) of cement and the cement-water ratio by weight expressed as weight of cement per pound of water. In addition, the water-cement ratio has been expressed as per cent by weight of water based on the weight of the cement and as pounds of water per sack of cement.

TABLE OF WATER CEMENT RATIO EQUIVALENTS

Proportions of standard portland cement and water required to make a wide range of mixtures.

U. S. Gals. of Water per Sack (94 Lb.) of Cement	$\frac{W}{C}$ by Volume	Cu. Ft. of Water per Sack (94 Lb.) of Cement	Per Cent by Weight of Water	Pounds of Water per Sack (94 Lb.) of Cement	$\frac{C}{W}$ by Weight, Lb. of Cement per Lb. of Water.	Remarks
2.00	0.268		17.8	16.7	5.63	Just about enough water to hydrate cement; paste not workable enough for concrete
2.25	0.301		20.0	18.8	5.00	
2.50	0.334		22.2	20.9	4.49	
2.75	0.368		24.4	22.9	4.11	
3.00	0.402		26.6	25.0	3.76	Paste still too stiff for concrete placed without mechanical compaction.
3.25	0.435		28.8	27.1	3.47	
3.50	0.468		31.1	29.2	3.22	
3.75	0.502		33.3	31.3	3.00	
4.00	0.535		35.5	33.4	2.81	Paste plastic enough for carrying small quantities of aggregate to produce concrete workable by hand.
4.25	0.568		37.8	35.5	2.65	
4.50	0.602		39.9	37.5	2.51	
4.75	0.635		42.2	39.6	2.37	Paste in general very mobile; excellent for durable, watertight concrete even in thin sections.
5.00	0.668		44.3	41.7	2.25	
5.25	0.703		46.6	43.8	2.14	
5.50	0.735		48.8	45.9	2.05	
5.75	0.769		52.0	48.9	1.92	On standing, water generally begins to separate from paste. Excess water floats to top. Maximum W/C for watertight concrete.
6.00	0.803		53.3	50.1	1.88	
6.25	0.836		55.4	52.2	1.80	
6.50	0.869		57.7	54.3	1.73	All water cement mixtures in this range so thin, and soupy, that they quickly segregate on standing; excess water on top, cement at bottom. Mixtures in this range have a markedly porous structure after hardening and drying out and should therefore not be used in thin sections for concrete subjected to trying conditions of exposure.
6.75	0.902		59.8	56.3	1.67	
7.00	0.936		62.2	58.4	1.61	
7.25	0.969		64.3	60.5	1.55	
7.50	1.002		66.5	62.6	1.50	
7.75	1.036		68.7	64.6	1.46	
8.00	1.07		71.1	66.8	1.41	
8.25	1.10		73.3	68.8	1.37	
8.50	1.14		75.4	70.9	1.33	
8.75	1.17		77.7	73.0	1.29	
9.00	1.20		79.8	75.1	1.25	
9.25	1.24		82.0	77.2	1.22	
9.50	1.27		84.3	79.3	1.19	
9.75	1.30		86.5	81.4	1.16	
10.00	1.34		88.8	83.5	1.13	

A. W. KING.

Chicago, Ill., Nov. 17, 1931.

Formerly Manager, Service Department, Cowham Engineering Co.

Earthquake-Proof Dam

Sir—Your description of an earthquake-proof type of dam in the Nov. 5, 1931, issue of *Engineering News-Record*, p. 725, is of particular interest at the present time.

Outstanding characteristics in the design of the Cogoti Dam, as compared with most rock-fill dams built in the past are the following: (1) that all parts of the fill are dumped (no hand- or derrick-placed material); (2) that the slopes of the rock fill are flatter than those corresponding to the natural slope of the material, thus providing the necessary safety against slides in the fill in case of earthquake shocks; and (3) the provision of a laminated-concrete face slab, the latter providing exceptional possibilities of readjustment by bending and slipping movements, without impairing its watertightness. Mr. Girand is to be congratulated for having introduced these principles into practice on a large scale.

In some cases it might be advisable to build the laminated slab directly against the natural slope of the earth or rock fill, smoothing out the latter by a layer of gravel, and depositing thereon the laminated slab, subsequently placing additional fill material on the upstream side of the slab on a slope flat enough to withstand disturbance by earthquake shocks, etc. This additional fill material would serve also to protect the slab against injuries due to floating logs, criminal attack with explosives and possible disintegration by freezing and thawing. A similar type of construction was used in the Palo Alto dam (*ENR*, March 26, 1931, p. 522).

In the ordinary type of upstream face slab a relatively small crack or hole might admit water from the reservoir. This would tend to saturate the fill and thereby might possibly lead to the destruction of the whole dam. (See account of failure of Sheffield dam, *ENR*, July 25, 1925, p. 147.)

Recent improvements in cement-gun construction suggest the use of gunite for laminated diaphragms in earth and rock-fill dams. Gunite can be shot against the prepared face of a fill dam on any slope and without the use of forms. A mixture as lean as 1:5 may be used wherein different types of admixtures may be added to advantage. The thickness of a watertight diaphragm in the interior of a filled dam is evidently of less importance than its flexibility and adaptation to settlements and other disturbances. For instance, a ½-in. steel plate, if properly supported and protected against corrosion, might serve the purpose as well as or better than a concrete slab several feet thick.

There are many objections to the use of steel plates for diaphragms in dams. A much better type of construction appears to be a reinforced-gunite seal wall containing as much reinforcing steel as is economically justifiable.

What is most needed in earth and rock-fill dams is a diaphragm that is not only watertight under ordinary conditions, but one that remains watertight also in case of disturbances resulting from the natural settling of the fill or from earthquake shocks. Thus, in a concrete corewall or face slab an excessive thickness may not only be wasteful but even detrimental, because such a wall, though subdivided by contraction joints into panels, is nevertheless relatively stiff and therefore subject to cracking, especially near its connection with the cutoff wall along the side hills.

In a laminated wall the several layers of gunite may be made only thick enough to protect the embedded reinforcing steel properly.

A type of seal wall similar to the one under construction by Mr. Girand in the seventeen dams in Chile, with several layers of gunite each from 3 to 4 in. thick and with membranes of waterproofing material between the several laminæ, would appear to be as nearly watertight and earthquake-resistant as can be conceived.

FRED A. NOETZLI,

Los Angeles, Calif., Dec. 2, 1931.

Consulting Engineer.

NEWS OF THE WEEK

Finck Succeeds Ruark as Sewerage Engineer of Baltimore

George E. Finck, who has been connected with the engineering departments of Baltimore for a number of years, has been appointed sewerage engineer of the city and head of the bureau of sewers. He succeeds Milton J. Ruark, who has been in the service of the municipality for almost 30 years. The bureau of sewers is one of the divisions of the department of public works, which is under the direction of Bernard L. Crozier, chief engineer of Baltimore. When Mayor Jackson made his appointments last October, Mr. Ruark was one of the few not replaced. He was not reappointed, however, and has been filling the office since that time as a holdover.

Mr. Finck was formerly connected with the paving commission of Baltimore and in 1922 became city engineer of Greensboro, N. C., resigning that post in 1925 to return to Baltimore as an assistant to Chief Engineer Crozier.

Rhode Island Authorizes Loans for Municipal Employment

At a special one-day session the general assembly of Rhode Island, by unanimous vote of both houses, passed a bill devised by Gov. Norman S. Case creating a $1,500,000 loan fund from which cities and towns may borrow to finance unemployment relief programs. The fund is derived from the state's unencumbered surplus, and is to be loaned at 3 per cent interest on notes due June 30, 1933. Each municipality may borrow up to a limit of 0.1 per cent of its assessed valuation.

Oklahoma City Builds Sewer Without Machinery

Banishing the use of all machinery except that which is absolutely necessary, Oklahoma City is providing employment for 165 men on a sanitary main and relief sewer project now under way. At its height the job will call for the employment of 200 men who otherwise would be out of work, according to T. G. Banks, city field engineer, under whose direction the work is being done.

The new main sewer extends 6,325 ft. along the old Rock Island right-of-way and is of 42-in. circular concrete pipe. Auxiliary lines include 3,470 ft. of 39-in. and 2,000 ft. of 24-in. diameters.

From 65 to 70 per cent of the workmen use picks and shovels, digging the trenches. The average depth is 10½ ft. The pipelaying group consists of 20 per cent of the total number employed. Smaller crews are kept busy cutting pavement, clearing right-of-way and building manholes. No machinery is used on the job other than an "A" frame with block and fall for lowering the sections of concrete pipe into place.

The project, started Oct. 30, will require more than 60 days for completion, but no time limit was set in the contract. The city council, in voting that the project be handled at this time, specified also that no labor-saving machinery be used. The rate of pay for the labor is 30c. an hour, with an eight-hour day maintained, except in cases where overtime work might prevent the blocking of traffic over night.

The engineering department has nothing to do with hiring of the workmen except to notify the city employment agency of the number of men required. All of the city's unemployed have been requested to register with the agency and only worthy laborers are sent out.

Rutgers Offers Fellowships to Unemployed Engineers

Six special research assistants will be appointed at Rutgers University, New Brunswick, N. J., to carry on investigations for the college of engineering during the spring term as the result of a plan proposed by Dean P. H. Daggett to provide employment for engineers. Applicants for appointment must be graduates of recognized engineering colleges and must present a certificate from the New Jersey state committee of the American Engineering Council indicating a real need for employment. A stipend of $150 for the term will be paid, and the assistants will be exempt from tuition fees.

Four of the fellows will be used in part-time work on studies dealing with the velocity of flow and sedimentation in tanks, uses of New Jersey sands for building purposes, slag as a material for sprinkling filters and the breakdown of rubber-insulated wires. The two others may propose original lines of investigation in the engineering field.

Mandamus Issued Against Missouri Highway Commission

Circuit Judge Stillwell at Jefferson City, Mo., has issued an alternative writ of mandamus ordering the Missouri state highway commission to show cause why it should not construct bridges and roads in Camden County. The county seeks to compel the commission to construct a $1,000,000 bridge across the Lake of the Ozarks, a body of water formed by the Union Electric Light & Power Co.'s hydro-electric dam and power plant on the Osage River at Bagnell, Mo. The writ is returnable on Jan. 4.

Bid for N. Y. Express Highway $628,581 Under Estimate

Award of the contract to build the superstructure of the second section of the express highway on the west side of New York City, this section extending from 22d to 38th St., has been made to the Poirer & McLane Corp., low bidder among 26 companies. The winning bid was $1,655,236.50, which is $628,581.50 lower than the estimate of the city's engineers.

Foremen's Safety Course Planned at Newark

A construction foremen's safety training course will be conducted at Newark, N. J., by the Newark Safety Council and the Associated Contractors of New Jersey, starting Jan. 7 and held every Thursday thereafter up to and including Feb. 18. Enrollment in the course is free of charge to foremen and higher executives interested in construction work. A graduation certificate will be awarded to each person enrolled who attends five or more sessions. All meetings will be held in the assembly room of the contractors' association at 9 Hill St., starting at 8 p.m. Each session will consist of two lectures and moving pictures related to safety work. W. L. Dill, managing director, Associated Contractors of New Jersey, and John Russell, Jr., chairman of the construction section of the National Safety Council, will be in charge. Further information may be secured from the Newark Safety Council, Chamber of Commerce Building.

Windstorm Does Much Damage in Arkansas and Tennessee

A severe windstorm during the night of Dec. 12 swept over parts of Arkansas and western Tennessee and caused much damage to buildings and roads. The greatest damage was in Camden, a city of 7,500 population and the county seat of Ouchita County, where the loss will total $700,000. The county court house was blown down and the First Methodist Church was practically destroyed, only the walls being left standing. A hotel, several stores, industrial plants and many residences also suffered greatly.

Memphis, Tenn., incurred $100,000 damage to streets, culverts and work in progress. In Brownsville, Tenn., a fire broke out and destroyed a four-story hotel and telephone building, the opera house and two stores, with $75,000 loss. Waldo, Ark., in Columbia County, had property damage of $400,000 to buildings and streets. Searcy, Ark., in White County, suffered about $30,000 damage to roads and bridges.

Committee Praises Labor Conditions at Hoover Dam

LABOR conditions at Hoover Dam, both past and present, are commended in a preliminary report made by a public information committee reporting to the Associated General Contractors and the American Engineering Council after an examination of the project. The committee is convinced that no valid grounds exist for criticism of any conditions affecting labor. The committee consists of three consulting engineers, J. B. Lippincott, of Los Angeles; Baxter L. Brown, of St. Louis; H. S. Crocker, of Denver, and three contractors, Henry W. Horst, of Philadelphia; Arthur S. Bent, of Los Angeles, and George B. Walbridge, of Detroit.

Living Conditions Good

The report states that notwithstanding the disadvantages forced on Six Companies by the pressure of public sentiment and from the government to rush the start of work during a summer of unprecedented heat, in order to furnish employment as quickly as possible, living facilities have kept pace with the need. Today these living facilities are reported as unusually good, the food being of the best, well cooked and well served. Housing conditions are reported clean and comfortable. The minimum wage paid is $4 for eight hours for common labor, running up to $10 for skilled labor. Men living in the dormitories are charged $1.60 per day for board, single rooms and transportation from Boulder City to the dam site and back.

Considering the hazards of the work, fatal accidents have been few, nearly all reported as being caused by the recklessness or carelessness of the men themselves. In a crew averaging 2,000, there have been twelve fatalities in eight months, about one death to 200,000 man-hours. Safety work is thorough.

At the time of the investigation the force numbered 2,800, of whom all but 81 were American born. Half of them are married and about 35 per cent are veterans. Employment is handled by a government bureau. Up to Dec. 1 applications received by the employment bureau numbered 29,000 by letter and 13,000 in person.

The report states the committee finished its investigation with high approval for the methods and operations of Six Companies and government officials in charge of the project. A complete report will be made public later.

Toronto's Relief Program

Work will be begun soon by the city of Toronto on the program authorized by the dominion government for the relief of the unemployed involving a total expenditure of $1,154,000.

NEW COURT HOUSE AND CITY HALL, ST. PAUL, MINN.

This building, under construction for the city of St. Paul and Ramsey County, occupies a city block bounded by Third, Fourth, Wabasha and St. Peter Sts. It is 232x267 ft. in plan, with a tower 114x112 ft. The main part has three stories, stepped as shown, while the tower has 21 stories and a height of 250 ft. from the sidewalk. A concourse three stories high extends through the building between Third and Fourth Sts. Exterior finish is of Indiana limestone, aluminum spandrels, and stainless steel vertical mullion ribs. The cost, exclusive of land, will be about $3,000,000. Work began June 22, 1931, and is to be completed by Oct. 1, 1932. The associated architects are Ellerbe & Co., St. Paul, and Holabird & Root, Chicago. The general contractor is Foley Brothers, Inc., St. Paul.

Hoover Dam Notes

The working force at Hoover Dam now numbers more than 3,100. The average weekly turnover since cool weather began is 60 men per week.

Stripping operations and portal excavation continued at the inlets of tunnels Nos. 1 and 2. Driving of the 41x56-ft. enlarged headings totaled 789 ft. during the week ended Dec. 12 at the inlet and outlet ends of diversion tunnels Nos. 2, 3 and 4, and was started at the inlet end of tunnel No. 1. Driving of the pioneer heading in tunnel No. 4 upstream from the central adit was stopped Dec. 7. The total progress in the pioneer headings during the week was 305 ft., all in tunnels Nos. 1 and 4.

The water system for Boulder City is 95 per cent complete, and work on the sewerage system is 97 per cent finished. Sewer work has been suspended awaiting the arrival of additional 6-in. and 12-in. pipe.

F. L. Ransome has completed his report on the geology of the dam site and adjoining areas.

A premature explosion in one of the anchorage tunnels for one of the suspension bridges being built across the river at the dam site killed one workmen and probably fatally injured another on Dec. 15.

Engineer Relief Plans Operating in Many Cities

A NATIONWIDE survey of plans for the relief of unemployed engineers discloses that relief committees have been organized in several of the larger centers where unemployment is serious and that in many other cities some less-well-organized attempts are being made to meet the local unemployment problem. In a few centers, where the problem was anticipated early in the fall, organization has been perfected, but most of the others are still working upon an organization that will meet their needs. In several instances local groups are working through state committees organized along the lines outlined by American Engineering Council.

Pacific Coast Activities

On the Pacific Coast, San Francisco engineering societies have set up an efficient organization to take hold of their relatively large problem. The local section of the American Society of Civil Engineers has contributed $500 as the nucleus of a relief fund and members have been urged to make regular monthly contributions.

Los Angeles engineers, through their newly organized Engineering Council, also are developing a relief plan, but it has not taken definite form. San Diego also is developing a plan.

Considerable unemployment has been found in the Pacific Northwest, but little progress has been made in helping engineers because the few available jobs are in civil service and the men out of work have not passed civil service examinations.

Relief work in Colorado is centered in the Colorado Society of Engineers in cooperation with local sections of the national societies. Engineers there have been fortunate in getting their own contributions to general relief funds, including those of men in civil service, earmarked for use by the engineers' relief committee.

Encouraging Reports From Mid-West

Little unemployment among civil engineers has been found in Kansas City, but a considerable amount has been found in other engineering groups. The civil engineers there are working independently on a periodic check of conditions among their own members and hope to raise a relief fund if needed. St. Louis has appointed a relief committee which is making a survey of needs and possible opportunities for work.

From Omaha comes a most encouraging report; no unusual unemployment exists there and no relief plans are proposed. The Iowa Engineering Society also reports no great amount of unemployment as indicated by the applications on file in its employment service. The society has urged staggered work on the state highway department for general

relief, and the department has acted on the suggestion.

Local sections of the national engineering societies are cooperating with the Engineers Club of Cincinnati in working out a relief plan based on the "Goodrich plan" and the Engineering Council plan but the organization is still in formative stage.

Columbus has one of the most advanced plans, the work being directed by the Central Ohio Professional Engineers Committee on Unemployment. Unemployed men have been registered and are being used to help the committee as far as possible, but the committee finds it hard to arouse many of them out of their lethargy. The state highway department, in its bridge-construction planning for general unemployment relief, has given work to about 30 engineers. The local engineering societies and the Engineers Club are bearing the administrative expenses and unemployed men are doing the clerical work.

Milwaukee's plans are in the formative stage, the Engineers Society of Milwaukee and the local sections of national societies cooperating.

No Organized Relief Work in Chicago

No organized relief work is under way in Chicago. A considerable amount of unemployment exists, but the organization of relief work among engineers is handicapped by the non-payment of salaries to many engineers by such services as that of Cook County and the Chicago Sanitary District, both in financial difficulties. A voluntary committee from among the many unemployed engineers recently made a survey of the principal engineering offices for possible jobs but without result other than a showing that only 800 men are at work in offices normally employing 2,000 engineers.

In Michigan unemployment is being approached on a statewide basis along the lines of the Engineering Council plan. The state is divided into five districts centering on Detroit, Saginaw, Grand Rapids, Traverse City and Houghton. Questionnaires to determine where work may be found have been submitted to the principal industrial and engineering firms in larger centers by members of the engineering organizations. The Michigan state committee, however, is directing its energies chiefly toward the stimulation of public works.

Activities in Pennsylvania

Relief work in western Pennsylvania is centered in Pittsburgh, where the local section of the civil engineers began a movement now taken up by the other local sections and the Engineers Society of Western Pennsylvania. This group is one of the few attempting to raise a relief fund. The work is still in its early stages.

In eastern Pennsylvania, the Philadelphia section of the American Society of Civil Engineers began late in November a survey of unemployment among engineers. It is directing its efforts toward finding positions through cooperation with the local city relief committee.

The Engineers Club of Trenton in October began a survey of unemployment. This did not reveal a large number of men out of work, but the committee has had difficulty in finding jobs for the few found. The committee is, however, cooperating in general relief plans.

Work in the South

In the South, a statewide committee in Louisiana is working on the Engineering Council plan for general relief and long-range planning. The Louisiana Engineering Society regularly maintains an employment office for the registration of men out of work. Birmingham, in a report to the American Society of Civil Engineers, notes an unusually large amount of unemployment and little result from relief work carried on in connection with general relief plans. From the Southeast, the Georgia section of the American Society of Civil Engineers reports that its regularly maintained employment service has an excess of applicants for work. A survey of the unemployment situation is in progress.

New England Getting Started

In New England, relief work is still in the formative stages. Boston has a relief committee appointed and in Connecticut work is expected to center in the statewide committee set up at the suggesion of Engineering Council.

Relief work in the New York metropolitan district has been reported previously in these pages. Progress to date is noted elsewhere.

San Diego Ends Water Fight and Votes to Build El Capitan Dam

After years of litigation and discussion, the city of San Diego, Calif., has settled its differences with the La Mesa, Lemon Grove and Spring Valley Irrigation District and has voted to make funds available for the construction of El Capitan dam on the San Diego River. This dam will be a 197-ft. earth- and rock-fill structure providing a storage capacity of 118,000 acre-ft. and producing an estimated yield of 10 m.g.d. for the city. The election by a five-to-one majority authorized the use of $2,693,000 of funds previously voted for a masonry structure at the site and the transfer of $926,000 left from a recently constructed pipe-line project.

The instituting of this major development on the San Diego River is a result of successful negotiations over the conflicting claims of the city and the irrigation district. For years the city has claimed the right to the waters of the San Diego River for domestic purposes. The district also has claimed rights to the water and has put to beneficial use a maximum of 27 sec.-ft. The conflict and litigation between these two interests made impossible the beginning of any comprehensive development of the river, whose floodwaters are of great value to the region. For some time negotiations have been under way between the two parties over settlement of differences and cooperative use of the San Diego River water supply. A satisfactory agreement was ratified shortly before the election and probably was an important factor in its success. Its principal features are: (1) The district secures 10,000 acre-ft. of storage capacity in El Capitan reservoir. (2) Maximum rate of diversion for the district is limited to 27 sec.-ft. (3) All litigation between the two parties is terminated. (4) The district's land holdings in the reservoir site are released to the city in return for the storage space in the reservoir. (5) The city acquires 5,000 acre-ft. of storage space in the Murry reservoir of the district, to provide close-in storage at satisfactory elevation for the city system. This agreement was fundamental in furthering the development of the river.

Plans for the dam have been approved by the state authorities and some of the funds are available immediately, so that construction activity is planned to begin at once.

In addition, the election authorized a $300,000 bond issue for general municipal improvements as an unemployment relief measure.

General Contractors Will Build Washington Incinerators

Bids of the Rust Engineering Co., Pittsburgh, Pa., and of the North Eastern Construction Co., Baltimore, Md., for the construction of two incinerators at Washington, D. C., have been accepted by the engineer commissioner of the District of Columbia. As already noted (*ENR*, Nov. 19, p. 826) the U. S. comptroller-general last spring ruled out as illegal the granting of contracts on the basis of designs prepared by the bidders. Consequently, working drawings detailing the buildings, furnaces, combustion chambers, flues, chimneys and other appurtenant parts, together with full specifications covering all equipment, were prepared by Metcalf & Eddy, consulting engineers, with the result that 53 general contractors took out copies of the plans and specifications and 24 bids were received.

On the O St. plant, with a capacity of 425 tons per 24 hours, the bid of the Rust Engineering Co. was low at $321,426, or $756 per ton capacity. For the Georgetown plant, 170 tons per 24 hours, the North Eastern Construction Co. bid $169,268, or $996 per ton of capacity. Corresponding low bids received last spring on manufacturers' designs for plants of the same capacity in the same locations were $399,000 for O St. and $181,000 for Georgetown, equivalent to $940 and $1,063 per ton of capacity, respectively.

Details of the grading and planting of the two sites were planned by Olmsted Bros., landscape architects, and were included in the plans submitted to bidders.

Canadian Population Census Shows Gain

The preliminary count of the returns of the seventh census of Canada, as of June 1, 1931, has been announced and shows that the population on that date was 10,353,778, an increase of 1,565,829, or a gain of 17.82 per cent.

Quick Action Gets Work for Unemployed Engineers

Prompt action by the Engineers Committee on Unemployment of the New York metropolitan district has resulted in providing approximately $60,000 for topographical survey work in New York and New Jersey. As about one-third of the expenditures for U. S. Geological Survey maps is for supplies and printing, about $45,000 of this money represents labor.

The Temple act provides money for topographic mapping under the direction of the U. S. Geographical Survey, but federal expenditures must be matched by state funds. When the New York committee found that there was a large unexpended balance in the federal treasury which must be allocated before the end of the year, it set about finding what state funds might be used for mapping. About $15,000 was found in each state which could be used for emergency relief work. As soon as this money was definitely located, John P. Hogan, of the committee, went to Washington and succeeded in getting like amounts of federal money allocated to the work. There is a possibility that still other relief funds in New York State may be available in time to be matched by federal funds.

Mapping work under the Temple act has been found to offer opportunities for like relief work in other states. Iowa, for example, hopes to obtain work for engineers under this act.

The Long Island State Park Commission expects to take on a number of men immediately for temporary work in connection with work it is doing jointly with the city of New York.

The New York committee on Dec. 18 had registered 950 men out of work. Of these, 485 were recorded as in need of immediate help. Temporary positions have been found for 337 of them, or 70 per cent of those in dire need. The committee has received $38,700 in cash and $15,000 in pledges, also $2,700 for administrative expenses.

Council for the committee, after examination of the income tax law, has advised it that contributions to its relief fund are deductible from income reported on income tax returns.

President Hoover's check for $5,000 is to be apportioned among regional relief committees as nearly as possible on the basis of membership in the national engineering societies. The New York committee, to which the check was sent, has asked each of the four national societies to appoint one representative on a sub-committee to arrange for the distribution of money among the relief committees set up in other cities. Because of the concentration of engineers in the New York metropolitan district, about one-fourth of the money will be available for use in that region.

COSTS AND CONTRACTS

ENR Index Numbers

Cost			Volume		
Dec. 1, 1931	166.23	Nov., 1931	180
Nov. 1, 1931	169.28	Oct., 1931	229
Dec. 1, 1930	196.86	Nov., 1930	207
Average, 1930	202.85	Average, 1930	260
Average, 1929	207.02	Average, 1929	317
1913	100.00	1913	100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of Dec. 24, with some comparisons, total as follows:

(In Thousands of Dollars)

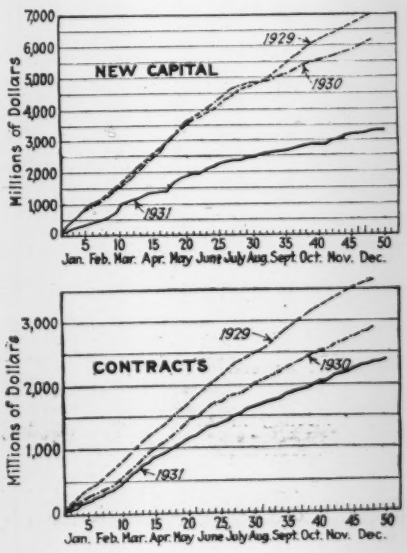
	Dec. 24, 1931	Average of Last Four Weeks 1931	1930
Buildings:			
Industrial	$1,344	$1,926	$2,926
Other	5,398	8,160	18,134
Streets and roads.	4,200	5,725	6,420
Other construction.	13,035	10,121	15,748
Total	$23,977	$25,933	$43,228

Total, all classes, Jan. 1 to Dec. 24:
1931 ..... $2,432,780
1930 3,173,359

Capital and Contracts

No private construction financing was effected throughout the entire country in the period Dec. 5 to Dec. 19, 1931, inclusive. In that period, moreover, but $9,000,000 in public bonds were issued. The average weekly total in November was $42,500,000, of which $30,000,000 went for public projects. The December, 1930, weekly average reached $73,000,000.

Cumulatively, the total for the period from Jan. 1 to Dec. 19, 1931, inclusive, amounted to $3,324,000,000, compared with $6,023,000,000 in the corresponding part of 1930.



WASHINGTON NOTES

By PAUL WOOTON

Washington Correspondent

Minor Changes Suggested in Administration of Bacon-Davis Prevailing Wage Law

IN THE OPINION of Representative Bacon, of New York, author of the prevailing wage law on government building work, any necessary minor adjustments in the act can be made without further legislation. Mr. Bacon has discussed the matter with Secretary of Labor Doak and contracting officials of the various departments, and as a result the officials are preparing recommendations on administrative policies intended to prevent the necessity of amending the act. Mr. Bacon has encountered no sentiment among departmental officials in favor of major changes in the law.

One complaint is that the law provides no specific penalty for violations, but Mr. Bacon believes that the government can abrogate the contracts if contractors refuse to pay the wages as finally determined by the secretary of labor. Nevertheless the contracting officials are working on a proposal to make it obligatory that building contracts be taken over by the government if the contractor fails to comply with the law. This is intended to make the bonding companies more wary, according to Mr. Bacon.

To Curtail Wage Rebate Practices

Departmental officials are also understood to be considering a proposal designed to eliminate complaints that contractors on federal work are forcing their employees to rebate part of their wages. To stop this practice it is suggested that all contractors on federal building work be required to file sworn statements monthly giving the amount of wages paid to each of their employees. If this were done, the government could penalize for perjury any contractor shown to be paying lower wages than indicated in his statements. Mr. Bacon has affidavits from a number of workmen on a federal building project outside of the District of Columbia that they were compelled by threats of dismissal to pay back part of their wages.

It is contended by Mr. Bacon that most of the trouble has been caused by what he terms as "broker contractors." This type of contractor, Mr. Bacon believes, makes a dishonest profit and disrupts the entire building industry by shopping around among subcontractors for lower bids after he has obtained an award from the government. To remedy this situation, a bill has been introduced by Representative Goss, of Connecticut, which would require bidders on public building projects to name their subcontractors, material men and supply men. A contract over $5,000 would not be awarded to any bidder who failed to file such a statement. Provision would be made in the contract for the payment

of liquidated demages if the contractor failed to utilize the services of the specified subcontractors and material men.

Advance Planning for Government Works

Whenever Congress is prepared to fix the amount to be spent by the federal government in additional emergency construction of public works, the Federal Employment Stabilization Board is prepared to submit estimates based on the advance planning programs of government construction agencies covering a six-year period from 1932 to 1938. In the few months since its organization under the direction of Donald H. Sawyer, the board has obtained reports, compiled on a uniform basis, setting forth 90 per cent of the construction that 100-odd federal agencies anticipate in year-to-year schedules. These are supplemented by reports on projects already authorized or appropriated for and by monthly reports on the progress of projects under way.

Senator Wagner, of New York, author of the law providing for the advance planning of public works, has introduced a resolution providing that the board prepare for immediate execution a two billion dollar program financed by a long-term bond issue. The senator contends that employment conditions warrant bringing into action without further delay the agency that was created to alleviate future depressions.

Personal Notes

A. R. Losh has been appointed manager of the asphalt and road oil division of the Anderson-Prichard Oil Corp., Oklahoma City. Mr. Losh until recently was city manager of Oklahoma City and prior to that was state highway engineer of Oklahoma and district engineer, U. S. Bureau of Public Roads, Fort Worth, Tex.

Daniel B. Miller has been appointed managing engineer in charge of activities on the Pacific Coast of the Asphalt Institute. Mr. Miller, since 1923, has been engineer adviser for surety companies on the Coast and formerly was chief engineer of maintenance for the Wyoming state highway department.

Lincoln B. Chambers, major, Corps of Engineers, has been relieved from duty at Fort Lawton, Wash., and assigned to Fort McIntosh, Tex., as commanding officer of the Eighth Engineer Squadron.

Ralph G. Wadsworth, for the past sixteen years associated with F. H. Tibbetts, consulting engineer, of San Francisco, has established his own office in Oakland, Calif.

Erle G. Hill, formerly associate professor of metallurgy in the school of mines, University of Pittsburgh, has been appointed to the fellowship at Mellon Institute of Industrial Research, Pittsburgh, recently established by the Lukens Steel Co., of Coatesville, Pa. The purpose of fellowship will be the scientific investigation of processes employed in the manufacture of steel plates.

Elwin G. Speyer, civil engineer, of Buffalo, N. Y., has been appointed consultant expert to the Buffalo planning board to assist in the preparation of a master plan for the city's future development.

Clyde E. Wallingford has resigned as city manager of Springfield, Ohio, and on Jan. 4 will take up his duties as the first city manager of Newport, Ky.

Obituary

C. F. Marshall, a resident engineer stationed at Bakersfield, Calif., for the state highway department, died Dec. 10. He was 46 years old.

Charles Herschel Koyl, engineer of water service of the Chicago, Milwaukee, St. Paul & Pacific Railroad for the last eleven years and with the Great Northern Railroad from 1912 to 1919, died Dec. 18 at the age of 76, in Evanston, Ill. Dr. Koyl was widely known for his development of water-softening methods, particularly hard waters for locomotive use, and was an active member of the water service committee of the American Railway Engineering Association. He was a member also of the Western Society of Engineers and American Water Works Association.

Philip Schuyler, managing editor of the *Western Construction News* since its inception in January, 1926, died in San Francisco Dec. 11, 1931, following an illness of several months. He was 51 years of age. A graduate of the civil engineering school of Cornell University, Mr. Schuyler went to California in 1899 and was employed by the state as inspector of hydraulic mining. He later became city engineer of Venice, Los Angeles County, Calif. He was a member of the American Society of of Civil Engineers and the American Water Works Association.

Frank H. Martin, of Winnipeg, Man., died in that city on Dec. 17 at the age of 50 years. Mr. Martin had been identified with hydro-electric developments of the Electrical Development Co., of Ontario, the Winnipeg General Power Co., the Mexican Light & Power Co., the Sao Paulo and Sapacia plants of the Brazilian Co., the Rio de Janeiro Tramway, Light & Power Co., the Toronto Power Co. at Niagara Falls, Ont., and the Ontario Power Co. at Niagara Falls. He first went to Winnipeg in 1914 as designing engineer for the Winnipeg River Power Co., and in 1921 became chief engineer for the Manitoba Power Co. at Winnipeg. Since 1924 he had been in consulting practice.

SOCIETY CALENDAR

AMERICAN ROAD BUILDERS' ASSOCIATION, Washington, D. C.; annual convention and road show, Detroit, Mich., Jan. 9-15.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York City; annual meeting, Jan. 19-22, New York City.

AMERICAN WOOD PRESERVERS' ASSOCIATION, Chicago; annual meeting, St. Louis, Jan. 26-29.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA, Washington, D. C.; thirteenth annual convention, Jan. 18-21, Milwaukee, Wis.

NATIONAL CRUSHED STONE ASSOCIATION, Washington, D. C.; fifteenth annual convention and exposition of quarry equipment and machinery and supplies, Pittsburgh, Pa., Jan. 19-22.

NATIONAL PAVING BRICK ASSOCIATION, Washington; annual meeting, Chicago, Feb. 10-12.

NATIONAL SAND AND GRAVEL ASSOCIATION, Washington; annual meeting, Pittsburgh, Jan. 27-29.

ASSOCIATION OF ASPHALT PAVING TECHNOLOGISTS will hold its annual meeting in Detroit on Jan. 14, in connection with the annual road show and convention of the American Road Builders' Association. A program has been arranged of papers, discussions and committee reports dealing with new and important developments in asphalt road-building machinery, asphalt paving research and new and improved mixing and construction methods that have been brought out during the past year.

INDIANA SECTION, American Water Works Association, will hold its 1932 meeting at Purdue University, Lafayette, Ind., March 9-10.

MARYLAND SECTION, American Society of Civil Engineers, held its annual meeting in Baltimore Dec. 10, and elected the following officers: president, Wilson T. Ballard; vice-president, Gustav J. Requardt; secretary-treasurer, James W. Armstrong. After the business meeting, a paper was presented by W. N. Brown, consulting engineer, Washington, D. C., describing the topographic survey of the upper Mississippi River and the application of aerial photography to such work.

METROPOLITAN SECTION, American Society of Civil Engineers, on Dec. 16 heard the development and work of the Long Island State Park Commission described and discussed by Robert Moses, president, Arthur E. Howland, chief engineer and general manager, and W. Earle Andrews, deputy chief engineer, of the commission. J. Spencer Smith, president of the New Jersey state board of commerce and navigation, told of the studies regarding beach control being fostered by the American Shore and Beach Preservation Association with the cooperation of the federal government.

NEW YORK SECTION, American Water Works Association, will hold its regular midwinter luncheon meeting on Dec. 29. William W. Brush, chief engineer, department of water supply, New York City, will tell of the recent activities of the New York City water department, including the 180,000,000-gal. pumping plant at Croton Lake. H. W. Baker, commissioner of public works, Rochester, N. Y., will give the report of the committee appointed to confer with the Public Service Commission of New York State on proposed meter regulations.

SAN FRANCISCO SECTION, American Society of Civil Engineers, has elected the following officers: president, George Pracy; vice-presidents, H. H. Hall and Nathan A. Bowers.

SOUTHEASTERN SECTION, American Water Works Association, will hold its annual meeting in Atlanta, Ga., March 22-24.

TACOMA ENGINEERS CLUB, Tacoma, Wash., has elected the following officers: president, Albert Worley; first vice-president, W. A. Kunigh; second vice-president, A. O. Onstad; secretary-treasurer, F. R. Zaugg.

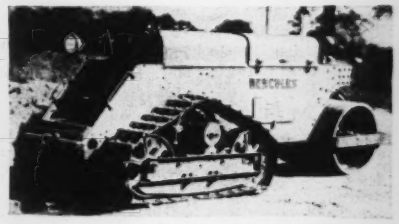
Construction Equipment and Materials

Two Units Withdraw From National Equipment Corp.

By action of the directors and stockholders of the several companies concerned, the C. H. & E. Mfg. Co., Milwaukee, Wis., and the Insley Mfg. Co., Indianapolis, Ind., have separated from the National Equipment Corp., of Milwaukee, of which the late Philip A. Koehring was president until his death last month. The National Equipment Co. was formed in 1928 through the merger of six companies engaged in the manufacture of construction equipment. The four other units are the Koehring Co., the T. L. Smith Co., the Parsons Co., and the Kwick-Mix Co.

Tractor and Roller Combined

Development of a single piece of equipment that will function as either a heavy-duty tractor or a road roller is announced by the Hercules Co., Marion, Ohio, in the Hercules Crawl Tractor, made in three sizes. This unit, it is claimed, is capable of working safely on ground so rough and broken that the ordinary tractor would pitch or roll over sideways. The chassis is mounted on two crawler trucks that are

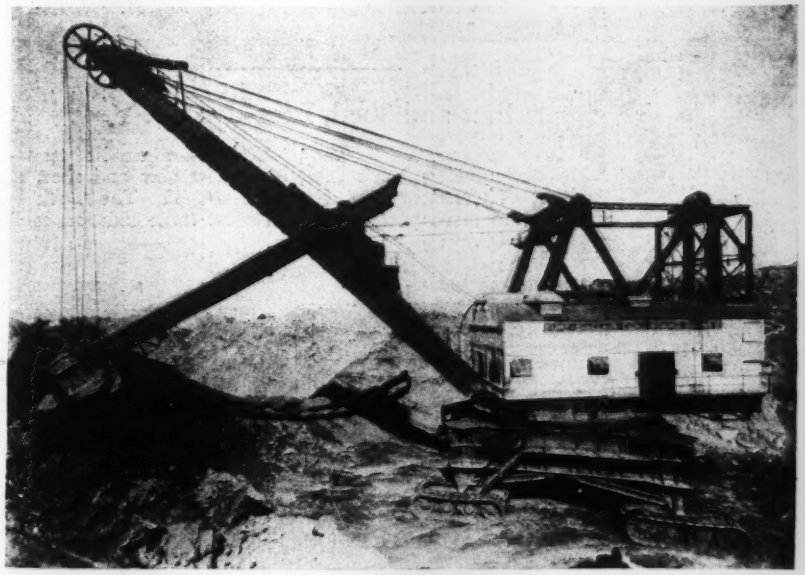


Model 60 crawl tractor

interchangeable with roller wheels and, together with a gyroscopic mounted front wheel, gives the machine a three-point suspension and unusual stability. All three models have three speeds forward and backward, the direction of motion being controlled by the movement of a single operating lever. As a tractor, the maximum speed is 2½ m.p.h.; as a roller 5½ m.p.h. Power provided by a six-cylinder gasoline engine is transmitted to the crawlers or rollers through disk rather than jaw clutches.

Lightweight Concrete Aggregate

Fine and coarse aggregate for use in lightweight structural concrete, in sand sizes down to 50 mesh and coarse sizes from ¼ to 1 in. in diameter, can be made by a process patented by Knox Harding, 542 South Fremont Ave., Los Angeles, Calif. A mixture of about 3 per cent ferric oxide and other granular carbonaceous materials with clay is thoroughly mixed and extruded from an auger brick machine through a multiple die which forms a number of round pugs. These are cut into short pieces and passed through a continuous rolling and coating machine, which forms them into a globular shape and covers them with fireclay. The balls are then passed through a rotary kiln and heated to a temperature above the fusing point of the center but below that of the refractory coating. It is claimed that in this process the center expands from four to seven times its original size while the outer coating remains intact, forming a dense watertight shell. The resulting material weighs from 17 to 27 lb. per cubic foot.



SHOVEL CAPACITY INCREASED BY MOVABLE COUNTERWEIGHT

Increases in the dipper size and operating speed of large stripping shovels without the use of larger electrical equipment are made possible by a new development of the Bucyrus-Erie Co., South Milwaukee, Wis., consisting of a balanced bucket hoist so arranged that as the dipper goes up through the bank in its digging motion, a movable counterweight travels downward in its guides, balancing the weight of the dipper and increasing the amount of digging force available. This moving weight replaces the fixed counterweight ordinarily used.

Business Notes

THE MATERIALS HANDLING INSTITUTE was formed Dec. 8 at a meeting in Cleveland, Ohio, attended by more than 70 representatives of materials-handling equipment manufacturers. The primary objectives of the association are the promotion of a more intense material-handling consciousness among industrial executives and of better internal relationships in the industry. Officers include: president, F. E. Moore, Mathews Conveyor Co.; vice-president, J. B. Webb, the J. B. Webb Co.; treasurer, H. W. Standert, Northern Engineering Works; secretary, J. A. Cronin, *Materials Handling & Distribution*. The board of governors comprises one representative from each division of the industry.

FERROUS FLANGED VALVE DIMENSIONS are the subject of a standard practice tentatively recommended for adoption as an American standard by a subcommittee of the Sectional Committee on the Standardization of Pipe Flanges and Fittings. Gate, globe and angle valves are included. This tentative proposal is being distributed for criticism and comment by C. B. LePage, assistant secretary, A.S.M.E. 29 West 39th St., New York City.

WELLMAN ENGINEERING CO., Cleveland, Ohio, has acquired the clamshell and trailer business of the G. H. Williams Co., Erie, Pa. Manufacturing activities have been transferred to Cleveland. Several Williams officials, including W. C. Swalley, secretary and general manager; A. J. Lichtinger, assistant manager; C. F. Weiblen, sales manager, and P. T. Robin, chief engineer, will be associated with the Wellman company.

FAIRBANKS, MORSE & CO., Chicago, Ill., announce the election of Robert H. Morse, formerly vice-chairman of the board of directors, to the positions of president and general manager. Mr. Morse succeeds W. S. Hovey, whose resignation took effect Dec. 1.

CONTRACTORS EQUIPMENT CO., Portland, Ore., has been formed by F. L. Hamann to handle a complete line of construction equipment, as well as rentals and the sale of new and reconditioned equipment.

CATERPILLAR TRACTOR CO., Peoria, Ill., has given the name of special sales division to a group of engineers contacting railroads, public utilities and equipment manufacturers. In accordance with the company's decision to enter the commercial engine field, it has appointed a special staff including W. J. Dakes, manager of engine sales, J. H. Howell, Harold G. Tufty, G. W. A. Bell, Jr., and C. D. Turley. J. N. Barnes, C. M. Burdette and F. G. Nunneley have been appointed assistant sales managers in charge of district representatives and groups of dealers.

DONALD FRASER, director and former vice-president and works manager of the Chain Belt Co., Milwaukee, Wis., died on Nov. 20 at the age of 78.

Current Construction Unit Prices

Garbage and Refuse Disposal in Boston

ALTERNATE bids were received Nov. 18, 1931, by the city of Boston, Mass., for the disposal of garbage and refuse over five- and ten-year periods. Final disposal of garbage is by the reduction process; of refuse, by filling marsh lands. Clean ashes and other heavy material may be dumped at sea. Refuse includes material from catch-basins, street sweepings, grass, garden refuse, ashes, automobile bodies and rubbish. Approximate tonnages of the material collected in the contract area are given below:

	Population	Garbage	Ashes and Rubbish	Street Sweepings	Material From Catchbasins
South Boston and part Dorchester	58,059	9,600	43,900	5,400	4,800
Charlestown	31,663	3,900	21,500	1,900	2,500
City proper, South End and Back Bay	151,818	16,300	132,400	24,700	15,400
Roxbury and part West Roxbury	92,027	22,100	63,100	4,000	14,000
Dorchester	187,103	19,000	.....	8,200	.....
	520,650	70,900	260,900	44,200	36,700

Total, all material, 412,700

The city owns land, wharves and buildings at Spectacle Island, in Boston harbor, now used for garbage reduction by the Coleman Disposal Co. under a ten-year contract to July 1, 1932. This property may be used by the successful contractor, who must, however, provide the equipment for the reduction process.

Five bids were received for each period, with low and average as follows: Five years, $2,250,000 and $2,514,000; ten years, $3,780,000 and $4,428,000. Yearly bids are given of the lowest two bidders: (A) Brooklyn Ash Removal Company of Massachusetts; (B) Coleman Disposal Co.; (C) C. & R. Construction Co. Consulting engineers are Metcalf & Eddy.

	A		B	C
1st 6 mos.	$395,000	$360,000	$395,400	$412,000
Next year	415,000	400,000	395,400	370,000
Next year	415,000	400,000	395,400	370,000
Next year	415,000	400,000	395,400	370,000
Next year	415,000	360,000	395,400	370,000
Last 6 mos.	195,000		395,400	
	$2,250,000		$2,372,000	
Next year		360,000		370,000
Next year		360,000		370,000
Next year		320,000		370,000
Next year		320,000		370,000
Next year		320,000		370,000
Last 6 mos.		180,000		412,000
		$3,780,000		$4,154,000

Highway Bridge at Wilmington, Del.

NEWCASTLE County, Del., is building a highway bridge 320 ft. 7½ in. between abutments, with 44-ft. roadway, to carry Eleventh St., Wilmington, across Brandywine Creek. Bids were received Oct. 15, 1931, on both 44-ft. and 30-ft. roadways, and prices were so favorable that the larger width was selected. The structure consists of five 50-ft. concrete-girder spans and a 63-ft. bascule span supported by five granite-faced piers, with concrete arch approaches at each end. The bascule span has 12 to 13 ft. clearance between mean high water and bottom of steel and 40 ft. between fenders.

Sixteen bids averaged $319,000, against the engineer's estimate of $330,000. Unit prices are given of the lowest two bidders: (A) Seeds & Derham, Philadelphia, $261,426, contract; (B) Walsh Construction Co., Syracuse, $275,534. Alban P. Shaw is county engineer; Ash-Howard-Needles & Tammen, Kansas City and New York, consulting engineers.

Item 1 is for concrete in the sixteen piers supporting the abutments, in retaining walls, handrails, and in the bases of piers 1 to 5. Item 4 is for concrete in piers 1, 2, 3 and 5, above tops of pier bases. The other concrete items are: (5) filling around street-car tracks on the concrete-girder spans; (6) class A concrete in handrails, gate protection posts, pylons, and retaining walls above tops of footings; (7) bascule pier above top of base, operator's house, girder spans, abutment walls and footings, columns for handrails; (19) bascule counterweight, gate counterweights. The six concrete items total $166,461, or 64 per cent of the total contract price.

		A	B
1.	2,200 cu.yd. conc. in approaches	$17.70	$26.00
2.	60 cu.yd. rock excav. for piers	3.00	6.00
3.	410 cu.yd. granite pier facing	90.00	75.00
4.	2,080 cu.yd. conc. in piers	11.25	11.13
5.	70 cu. yd. conc. fill around car tracks	7.50	10.33
6.	430 cu.yd. class A conc. handrails	17.25	22.46
7.	3,400 cu.yd. conc. bascule pier	15.30	15.65
8.	510,000 lb. reinf.	.04	.032
9.	Special rubbed finish on conc.	2,770.50	2,872.00
10.	31,000 lb. cast steel	.135	.119
11.	510,000 lb. struct. steel and misc. metal	.06	.0571
12.	Floor on bascule span	2,500.00	2,046.92
13.	50,000 lb. machinery	.17	.1665
14.	Main operating motor	8,900.00	8,042.00
15.	Operators' house	5,000.00	5,380.00
16.	Three trolley frames and s x poles	3,200.00	2,828.00
17.	Sump pump, complete	850.00	771.00
18.	Timber in fenders	3,200.00	3,176.00
19.	154 cu.yd. conc. bascule span	27.00	18.32
20.	43,000 lb. c.i. counterweight	.025	.0212
21.	1,270 sq.yd. asphalt conc.	2.00	1.50
		$257,261.00	$263,872.10
		+4,165.00	+11,662.00
	Total	$261,426.00	$275,534.10

Subway Station Finish in Brooklyn, N. Y.

BIDS were received Nov. 20, 1931, for station finish on Secs. 1 to 4 of Route 110, New York subway system. The lowest three bids on the principal items are given below:

	A	B	C
500 cu.yd. conc. masonry	$0.40	$0.50	$0.80
3,000 lb. architectural steel	.18	.15	.15
11,000 sq.ft. 3-in. finish for conc. floors	.15	.17	.20

Pier and Shed, Brooklyn, N. Y.

BIDS were received Nov. 20, 1931, by the board of transportation, New York City, on a new pier and shed at the foot of Cranberry St., Brooklyn, N. Y. The work is divided into three parts, and the lowest three bids on each are given below:

	A	B	C
I—70,000 cu.yd. dredging	$0.486	$0.71½	$0.75
II—153,000 lin.ft. piles	.43	.52½	.55
290 M ft. b.m. dock timber	75.00	75.00	75.00
III—concrete deck, shed	168,000.00	182,000.00	183,000.00

Lowest bidders on each part were: (I) Morris & Cummings Dredging Co., 44 Whitehall St.; (II) Pierce Steel Pile Corp., 500 Fifth Ave.; (III) Meads Engineering Co., Inc., 217 West Fourteenth St.

Dredging Houston Ship Channel

UPPER BAY section of the Houston Ship Channel is being dredged for a distance of 65,000 ft. between Morgan Point and Red Fish Reef to a depth of 37 ft. for a width of 250 ft. Yardage is 4,160,000 and the unit prices of the three bidders were 3.69c., 6.8c. and 7c. Contract price is $175,644, and includes 600,000 cu.yd. overdepth. Material is silt, sand and mud and some clay. Average distance to spoil bank is 1,200 ft. Mean tidal range is 1.3 ft. in lower Galveston Bay and 0.6 ft. in the upper bay. The channel to Morgan Point has been dredged 30 ft. deep and 250 ft. wide.

CONSTRUCTION NEWS

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Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

Location	*Project*	*Cost*	*Status*
Bridges			
Massachusetts	Bridge	$2,000,000	Proposed
Streets and Roads			
New York	Elevated highway	1,655,237	Contract
Montreal (Que.)	Trans-Island boulevard, etc	14,028,000	Proposed
Waste Disposal			
New York	Incinerators	4,400,000	Proposed
Grade Crossings			
Ithaca (N. Y.)	Grade elimination	3,640,000	Proposed
Federal Government			
Springfield (Mo.)	Hospital	1,710,000	Contract
Norfolk (Va.)	Post office	2,000,000	Proposed
Power Plant			
Seal Beach (Calif.)	Power plant addition	3,500,000	Proposed
Buildings			
New York	Hospital and home	1,000,000	Proposed
New York	Hospital	1,000,000	Proposed
Attica (N. Y.)	Cell house	1,587,722	Contract
New York	Jail	1,000,000	Proposed
Atlantic City (N. J.)	Railroad terminal	4,500,000	Proposed
Cambridge (Mass.)	Technical high school	1,500,000	Bids asked
Hampden (N. J.)	High school	1,000,000	Proposed
Jersey City	Senior high school	2,000,000	Proposed

WATERWORKS

PROPOSED WORK

Calif., Fresno—F. M. Barnwell, clk. Fresno Co., rejected bids Nov. 27, pipe line, pumping station at county sanatorium. Will readvertise. Noted Nov. 19.

Calif., Woodland—Installing larger mains to increase capacity affording better fire protection and domestic service. To exceed $15,000.

Ia., Council Bluffs—City, a new pumping plant will be necessary here in event Missouri River Channel is straightened. $450,000. J. C. Jensen, chn. Water Bd.

Ia., Mason City—City does not plan waterworks improvements, incl. tank, main extensions. $68,000. C. H. Stevens, city engr. This corrects report in Dec. 17 issue.

Mass., Lowell—City, plans pumping station alterations, incl. new boilers. Pawtucket Blvd. $25,000. J. G. Hill, supt. Water Dpt.

Mich., Kalamazoo — Reservoir. $150,000. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

Mo., St. Charles—Preliminary plans water filtration plant, equipment. Russell & Axon, Roosevelt Bldg., 4903 Delmar Blvd., St. Louis, engrs.

N. D., Williston—Soon takes bids water distribution system. $25,000. Burns & McDonnell Eng. Co., 406 Interstate Bldg., Kansas City, Mo., engrs. Noted Nov. 5.

Wash., Snohomish—City applied to State Div. Hydraulics to divert 21 cu.ft. sec.ft. water from Pilchuck River for additional water supply to supply suburban residents. $250,000.

Wis., Stevens Point—River Paper & Pulp Co., Neenah, plans equipment and machinery for removing iron and manganese from water supply. $15,000. W. G. Kirchoffer, 22 North Carroll St., Madison, engr.

Ont., Aylmer—Town, 6 -to 12-in. c.i. pipe main from pumphouse to Front St. and larger main in Main St. $17,300. W. E. Stewart, Aylmer, engr.

Ont., Sarnia—See "Unclassified."

Que., Black Lake—Town Council, waterworks. $35,000.

BIDS ASKED

Ind., Anderson—Bd. P. Wks., City Hall, bids about Apr. 1, modernizing water plant, incl. new settling basins. $200,000. H. Gwinnup, city engr.

Utah, Washington—See 'Contracts Awarded."

Wash., Seattle—Bd. P. Wks, bids about Jan. 11, extending mains along Graham St. and adjoining streets in Beacon Hill Dist. $22,000. D. W. McMorris, Seattle, engr.

CONTRACTS AWARDED

Conn., Hartford—Bd. Contr. & Supply, Metropolitan Dist., Hartford Co., Municipal Bldg., 550 Main St., clearing 250 acres East Branch Valley, Farmington River, to Curtiss & Dean, Village St., East Hartford, $9,578; borings Bills Brook Dam Site, to Battle Bros., Scranton, Pa., $5,166; Contr. 8, portable air compressor, to K. B. Noble Co., 249 Pearl St., $1,800; Contr. 7, sand washing machine, to M. L. Bayard & Co., 20th St. and Indiana Ave., Phila., Pa., $12,500. Grand total $29,044. Noted Nov. 26.

Conn., New Haven—New Haven Water Co., 100 Crown St., New Haven, 2 basin reservoir, Mill Rock Reservoir, 1 m.g.c., at Hamden to replace Prospect St. Basin, New Haven, to C. W. Blakeslee & Sons, Inc., 58 Waverly St., New Haven. Est. $200,000.

Ind., Ft. Wayne—Bd. P. Wks., general contract river filtration and pumping station, to Max Irmscher & Sons, 1113 1st Natl. Bank Bldg., $878,690; pumping units, to Byron-Jackson Co., 2150 East Slauson Ave., Los Angeles, Calif.; electrical contract, to V. M. Nussbaum Co., 220 Douglas St., $32,815. Total est. $1,000,000. Noted Oct. 8.

Mass., Boston—City, Park Dpt., laying water pipe, Franklin Park, to A. G. Tomasello & Son, Inc., 250 Stuart St., $10,981. Est. $15,000.

Michigan—H. W. Hagaman, div. engr., Saginaw, 1 span 40 ft. steel deck girder bridge, 2 rein.-con. abutments, 40 ft. roadway, two 2.5 ft. sidewalks, Contr. FB1 of 25-4-11, Genesee Co., for State Hy. Dpt., Lansing, Contr. 2, to Fort Pitt Bridge Wks., Massillon, O., $1,219; Contr. 3, to L. C. Anderson, Lake Orion, $7,462. Noted Nov. 26.

Mo., Marshall—City, water softener plant, equipment, to Lakeside Eng. Corp., 176 West William St., Chicago, Ill., $30,000. Local labor will be used in construction work.

Utah, Washington—Water works, day labor. $15,000. F. Stahele, mayor.

Ont., Haileybury—Town, 10,000 ft. 8 in. c.i. mains from Constance Lake to town reservoir, to McNamara Constr. Co., 53 Yonge St., Toronto, $18,600. Noted Nov. 19.

SEWERS

PROPOSED WORK

Mass., Salem—Storm water sewers in Winthrop, Broad and Chestnut Sts. $25,000.

Mich., North Muskegon (R. Sta. Muskegon) —City, sewage pumping station disposal plant, $60,000 Boulay Harrison Co., 914 Summit St., Toledo, O., engrs.

Mo., Deepwater—See "Contracts Awarded."

N. J., Butler—Bd. Boro Council, High St., 2 filtration beds for sewage treatment plant. $25,000. **Maturity soon.**

N. J., Mount Holly—Bd. Freeholders Burlington Co., 2 storm sewers in Burlington. $27,000. H. B. Smith, Mount Holly, engr.

N. D., Enderlin—Soon takes bids sewers, sewage disposal plant. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

Pennsylvania—Delaware Co. plans prepared and submitted permits issued for sewers in Chester, Upland and Rutledge Boros., Ridley and Darby Twp., sewers and outline plans of sewage treatment works in Radnor and Haverford Twps., sewers, remodeling old sewage treatment works in Tinicum Twp., sewers and sewage treatment works previously erected in Eddystone Boro. W. L. Stevenson, ch. engr. Commonwealth of Pennsylvania, State Bd. of Health, Harrisburg.

Pennsylvania—West View Twp., H. P. McKown, engr., Boro Bldg., Millvale Boro, S. H. Burns, engr., Williams St., Ross Twp., McCully Eng. Co., engrs., Berger Bldg., Pittsburgh, and Shaler Twp., F. G. Ross, engr., 309 4th Ave., Pittsburgh, plans in progress, probably take bids in January or February, Girtys Run Trunk Sewer. $200,000. Noted Aug. 14.

S. D., Dell Rapids—For 3,000 lin.ft. 12 in. outlet sewer, disposal plant. $25,000 bond election soon for same. Buell & Winters Co., 510 Insurance Bldg., Sioux City, Ia., engrs.

Que., Coaticook—Town sewers, paving streets. $30,000.

Que., Pointe Aut Trembles—Plans sewers. $28,000. Work will probably be done by day labor.

Que., St. Alexis de LaGrande Baie—Soon takes bids sewers, paving streets. $33,000. Work will probably be done by day labor.

BIDS ASKED

Ill., Decatur—Dec. 30, by Decatur Sanitary Dist., W. C. Field, pres., sewage treatment plant, $58,000. Pearse, Greenley & Hansen, 6 North Michigan Ave., Chicago, engrs. Noted Nov. 19.

Ia., Belle Plaine—Bids about Mar. 1, outfall sewer, pumping plant, sewage treatment works. Howard R. Green, 617 1st Ave. S.E., Cedar Rapids, engrs.

Ia., Newton—City Council bids about Feb. 1, remodeling sewage disposal plant, incl. new trickling filter, changing 2 sandbed filters to trickling filters. $60,000. L. Higgins, 211 Continental Bldg., Des Moines, engr. Noted Dec. 17.

Mo., St. Louis—Jan. 19, by Bd. P. Serv., City Hall, Sect. A-2, Maline Creek Public Sewer, foul water sewer below Maline Creek Channel from Mississippi River to waterworks conduit right-of-way, incl. 1,900 ft. 42 in. monolithic concrete or rein.-con. pipe or 45 in. brick sewer, $17,000; also brick, concrete comfort station, Fairgrounds Park, Grand Blvd. and Natural Bridge Ave., $22,000. W. W. Horner, city engr.

N. Y., Long Island City—Dec. 28, by J. J. Halleran, acting pres. Queens Boro, Queens Subway Bldg., sewers in 64th Rd., 84th Dr., Ditmars, 64th, 65th, 84th, 115th Aves., 71st, 98th, 99th, Edward, 45th, 217th, 130th, 174th, 175th, 176th and Barron Sts.

N. Y., Oneonta—Dec. 29, by Commissioner Dpt. Educ., Education Bldg., Albany, sewers, water lines at Oneonta State Normal School. F. P. Graves, comr. Noted Nov. 26.

Pa., Lancaster—Dec. 30, by T. W. Metzger, mayor, Unit 4, water and sewerage system, incl. mesh screen house, clear water reservoir lined and covered, steam gaging station, remodeling existing slow sand filtration bed, fast filtration

See proposal advertising on page 43

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LEADITE

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Long years of Satisfactory Service have demonstrated the real value of

Bell and Spigot Water Mains

and of

LEADITE

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The pioneer self-caulking material for c. i. pipe
Tested and used for over 30 years.
Saves at least 75%.

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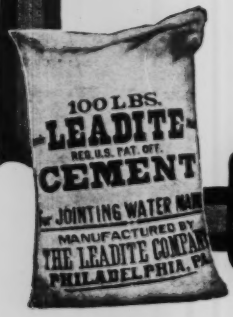
Land Title Building - Philadelphia, Pa.



No Caulking

Sewers (Continued)

bed, flash boards and mechanical equipment for raising existing dam in Conestoga Creek, $400,000. Total est. $3,500,000. E. Edgerly, city engr. J. N. Chester Engineers, Clark Bldg., Pittsburgh, engrs.

Pa., North Braddock—See "Materials."

Ont., Sarnia—See "Unclassified."

CONTRACTS AWARDED

Miss., Hattiesburg — City Comn., 1,550 ft. sewer lines, septic tank, to T. P. Crymes, Hattiesburg.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., sewers in 61st Ave., to M. L. Klostergard, Patterson Rd., Donigan Hills, $38,244; Northern Blvd., to Matarazzo & Yondola, 1163 61st St., Brooklyn, $1,418. Noted Nov. 26.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., to Catani Co., Inc., 8211 Bay Parkway, Brooklyn, sewers in Ridge St., $2,779, 45th Rd. $1,759, 152nd St. $2,919; to P. J. Greenough, 9919 Guilford Ave., Forest Hills, 41st Ave. $1,987; Clemente Bros., 71st Ave. $3,968, Union Hall St. $1,880; to A. Capasso, 4121 Gunther Ave., New York, 88th St. $12,979, Foch Blvd. $3,180; to Trifoglio Constr. Co., 105 Monroe Ave., Tompkinsville, 190th St. $5,847; to J. Deliso, 9839 Old South Rd., Ozone Park, 207th St. $1,952; to E. Meluccio, 1209 61st St., Brooklyn, Wren Pl. $1,622. Grand total $40,872. Noted Dec. 3.

N. Y., New York—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., sewers in Magenta St., to Coddington Avenue Constr. Co., 2883 Coddington Ave., $628; Paulding Ave. to C. Turiano Contg. Co., 2913 Coddington Ave., $1,377; Boston Rd., to A. Spadaro, Inc., 724 East 225th St., $8,541. Grand total $10,546. Noted Dec. 3.

New York—Westchester Co. Sanitary Sewer Comn., Court House, White Plains, connecting lines for Orienta Point and Shore Acres, in Mamaroneck, part South Yonkers Project, to A. W. Byrne & Sons, Hartford, Conn., $37,252; section South Yonkers sewer, to Rocco Constr. Co., 576 Exterior St., New York, $183,059; bulkhead at Mamaroneck, to C. D. Beckwith, Inc., Seneca Ave. and Edgewater Rd., New York, $47,585. Grand total $267,896. Noted Nov. 12.

O., Maple Heights—For 3,400 ft. 42- to 60-in. and 3,400 ft. 12 in. vitr. clay and concrete sewer in Center Rd. Outlet 3, to Haddad-Mall Co., Nottingham and Waterloo Rds., Cleveland, $52,500. Noted Dec. 3.

Pa., Allentown — City, Trout Creek Trunk Sewer, incl. 5,000 cu.yd. trenching, Imhoff tank, to Christ Donatelli, 325 Sumner Ave., $39,648. Est. $60,000.

R. I., Bristol—Bristol Sewer Comn., at office H. K. Barrows, engr., 241 Thames St., and 6 Beacon St., Boston, Mass., 2,700 ft. 18 in., 1,735 lin.ft. 21 in. and 960 lin.ft. 4 in. rein.-con. interceptor and 480 lin.ft. 10 in., 1,320 lin.ft. 14 in. B and S c.i. force mains in Hope, Oliver and Constitution Sts., Contr. 1, to L. H. Callan Constr. Co., Bay View Ave., $36,932. Noted Dec. 3.

WASTE DISPOSAL

PROPOSED WORK

New York—Dpt. Sanitation, Municipal Bldg., New York, bids in January or later, incinerators at West 215th and 216th Sts., 9th and 10th Aves.; at Cromwell and River Aves., East 150th St., Bronx Boro, Zerega Ave. and Westchester Creek, Bronx Boro, $1,000,000 each; and at Northern Blvd. and 226th St., Douglaston, Queens Boro, $1,400,000. Noted July 30.

Wis., Milwaukee—Sewerage Comn., 1 story, 30 x 140 ft., rein.-con., steel, brick incinerator, wood pile found., at sewage disposal plant. J. L. Ferebee, city engr.

CONTRACTS AWARDED

D. C., Wash.—District Comrs., District Bldg., incinerator 31st and K Sts., Georgetown, to Northeastern Constr. Co., 6 West Madison Ave., Baltimore, Md., $169,286; incinerator, at 1st and O Sts., to Rust Eng. Co., Koppers Bldg., Pittsburgh, Pa., $321,416. Noted Nov. 12.

BRIDGES

PROPOSED WORK

Massachusetts — Commonwealth of Massachusetts, Dpt. P. Wks., State House, Boston, A. W. Dean, engr., bridge to have 175 ft. draw over Fore River between Quincy and Weymouth. $2,000,000. Fifty per cent of cost to be borne by nearby towns and cities.

Missouri—Jackson Co. (Independence) and Chicago & Alton R.R. Co., A. Chinn, ch. engr., 340 West Harrison St., Chicago, Ill., widening rein.-con. viaduct over railroad tracks on Van Horn Rd. between Kansas City and Independence. $47,538. L. E. Koehler, Court House, Independence, co. engr.

Ore., The Dalles — City, F. F. Thompson, mayor, bridge over Columbia River. $650,000 voted. Engineer not appointed.

Texas—State and Orange Co., 2 span, 3,000 ft. bascule type, rein.-con., steel vehicular bridge over Neches River, Dryden Ferry, on Orange Rd., Orange Co. $200,000. Address U. S. Engineer Office, Trust Bldg., Galveston, for information.

Virginia—State Hy. Comn., Richmond, will be asked to allocate $90,000 as of July, 1932, for 2 bridges to replace old ones on Laskin Rd. to Virginia Beach, Princess Anne Co.

Ont., Cornwall—Cornwall and Massena International Bridge Co., Cornwall, planking New York Central Railway bridge to convert into vehicular traffic bridge, requiring creosoted plank, hardware, etc., for 8,000 ft. bridge, 2 mi. concrete paving, railway signal devices, etc. $140,000. A. Horovitz, Cornwall, engr.

BIDS ASKED

Ill., Joliet—Jan. 12, at office Dpt. Purchases & Supply, Springfield, Illinois Waterway Bridge, Contr. 6, covering substructure, approaches for Jackson Street Bridge, substructures Cass St. and Jefferson St. Bridges. For information address Div. Waterways, 220 South State St., Chicago; adv. E. N.-R. Dec. 24.

Ind., Indianapolis—Jan. 26, by State Hy. Comn., Indianapolis, 120 ft. rein.-con. bridge, 40 ft. over White River at 64th and Meridian Sts., Marion Co. $300,000. J. J. Brown, dir.

Michigan—Dec. 29, by H. W. Hagaman, div. engr. Saginaw, F-Bridge of 1 of 56-8-2, Contr. 2, 2 semigravity type rein.-con. abutments, 2 skeleton type rein.-con. piers over Tittabawasses River; F-Br. 1 of 56-8-4C-2, 2 semi-gravity type concrete abutments, heights 194 ft. from bottom to crown of roadway over Salt River, both Midland Co., for State Hy. Comn., Lansing.

Mo., St. Louis—Jan. 19, by Bd. P. Serv., City Hall, rein.-con. found. piers for northwestern railroad approach to St. Louis Municipal Bridge across Mississippi River, to Terminal Railroad Association yards, near 12th and Poplar Sts. $127,000; also for 3,500,000 bd. ft. timber, $225,000. C. E. Smith & Co., Railway Exch. Bldg., consult. engrs. Bids later steel fabrication, erection, painting for approach, $906,000.

New Jersey — Jan. 4, by State Hy. Comn., Trenton, bridge over Phila. & Long Branch R.R., Route 40, Sect. 6, near Upton Station, Burlington Co. A. L. Grover, ch. engr.; adv. E. N.-R. Dec. 24.

Ohio—Dec. 29, by O. W. Merrell, dir. hys., Columbus, concrete, concrete beam, rein.-con. culverts, creosoted timber, with steel stringers or steel bridges, in Ashland, Auglaize, Belmont, Brown, Champaign, Clark, Clinton, Columbiana, Crawford, Dike, Erie, Franklin, Fulton, Geauga Guernsey, Hardin, Henry Jefferson, Lawrence, Logan, Lorain, Marion, Meigs, Miami, Muskingum, Butler, Mahoning, Scioto, Summit, Van Wert, Pickaway, Portage, Richland, Ross, Sandusky, Stark, Trumbull, Union, Warren, Wayne and Wood Counties; some of the larger projects are two 50 ft. span, concrete beam bridge, 24 ft. roadway, approaches, Sect. "D" Alliance-Yale Rd., Stark Co., $20,955—three 36 ft. span, concrete beam bridge, Sect. "F" Georgetown-Wilmington Rd., 24 ft. roadway, Brown Co., $21,420—two 52 ft. approach span and 65 ft. center span, concrete beam bridge, with steel beams, 35.4 ft. roadway, and one 4.75 ft. sidewalk, Sect. "N" National Rd., Clarke Co., $50,633—three 45 ft. span concrete beam bridge, 30 ft. roadway, one 4 ft. sidewalk, Sect. "M" Ohio River Rd., Jefferson Co., $40,-104—three 30 ft. span concrete beam bridge 24 ft. roadway, Sect. "E" Marion-Kenton Rd., Marion Co., $24,541—extending concrete arch bridge, one 50.5 ft. span, one 50.33 ft. span and extending new roadway to 44 ft. and ap-ft. span slab and girder bridge, 30 ft. roadway, proaches, Sect. "L-3" Columbus-Newark Rd., Franklin Co., $22,397—two 25 ft. span, one 30 two 5 ft. sidewalks, Sect. "E" Pomeroy-Jackson Rd., Meigs Co., $29,482—75 ft. span concrete bridge, with steel girders, 28 ft. roadway, two 4.5 ft. sidewalks, Sect. "Tarlton" Chillicothe-Lancaster Rd., Pickaway Co., $25,806. Total est. $748,038.

Okla., Eufaula—Dec. 29, by State Hy. Dpt., Oklahoma City, reconstructing 700 ft. pile trestle bridge over North Canadian River, incl. 69,400 ft. treated and 9,200 ft. untreated timber, 1,010 ft. wooden piling, McIntosh Co. $40,000. C. L. Wilson, hy. engr.

Virginia—See "Streets and Roads."

West Virginia—Dec. 29, by State Road Comn., Charleston, Caldwell Bridge 1280, three 160 ft. span steel superstructure, Project 140-E, Greenbrier Co.—Lomans Branch Bridge 1300, 30 ft. span concrete arch, Project 3489, Hampshire Co.—Cheat Bridge 1297, concrete substructure only, Project 151-F, Preston Co.—Hog Island Bridge 1207, one 100 ft. and one 140 ft. spans, concrete substructure and superstructure, (separate proposals) Project 3467, Webster Co.—grading, drainage structures 1.4 mi. Flat Top Yards-Wolfe Rd., Project 3482-B, Mercer Co. G. E. White, secy.

Que., Montreal—See "Streets and Roads."

CONTRACTS AWARDED

California—Bd. Comrs. Los Angeles and Orange Counties and cities of Long Beach and Seal Beach, vehicular bridge at entrance of Alamitos Bay, at Orange Ave. connecting Long Beach and Seal Beach to John Strona, Philadelphia St. and East End Ave., Pomona, using Douglas fir, $54,868; steel, to Consolidated Steel Corp., 1200 North Main St., Los Angeles, $13,100. Noted Aug. 6.

California — C. H. Purcell, engr. State Hy. Comn., Sacramento, 2 rein.-con. bridges, San Luis Obispo Co., to Bodenhamer Constr. Co., 354 Hobart St., Oakland, $41,775. Noted Dec. 3.

Ill., Urbana—Champaign Co., one 50 ft., one 40 ft. span rein.-con. deck girder bridges, Sect. 84B-M.T.T., to Kent & Co., Champaign, $12,-104—widening roadway on 60 ft. steel truss bridge, Sect. 86B-15d, to T. J. Covert, Champaign, $2,887—two 12 x 10 ft., two 8 x 8 ft., three 6 x 10 ft. rein.-con. box culverts, Sect. 90B-15d, to O. L. Shoemaker, Champaign, $5,189. Grand total $20,180. Noted Dec. 3.

N. J., Berlin—See "Railways" under Pennsylvania.

Texas—G. Gilchrist, state hy. engr., Austin, three 28 ft. 6 in. steel I-beam span bridges, concrete floor slabs, 22 ft. roadway and 4 multiple box culverts, Hy. 34, Ellis Co., to Thomas & Ratliff, Rogers, $29,611 est. $30,000—five 28 ft. 6 in. span rein.-con. bridges, 24 ft. roadway, Hy. 3-A, Gonzales Co., to W. W. Vann & Co., Mercedes, $49,619 est. $50,000—two 28 ft. 6 in. I-beam span rein.-con. deck girder bridges, Hy. 1, Culberson Co., to L. D. Parks, 4108 Bunting St., Fort Worth, $21,019 est. $34,000. Grand total $100,249.

Tex., Austin — Bd. Regents University of Texas, c/o J. W. Calhoun, comptroller, 2 arch span, stone-faced, concrete bridge over Waller Creek on San Jacinto Blvd., on University of Texas Campus, at Sta. 36 + 03, and 3 arch span, stone-faced concrete bridge over Waller Creek on San Jacinto Blvd., at Sta. 22 + 90, to Langston Constr. Co., 5650 Swiss Ave., Dallas, $16,448 and $26,475 respectively. Est. $30,000 and $40,000 respectively. Noted Nov. 12.

Wisconsin and Minnesota—Wisconsin State Hy. Comn., Madison, Wis., repairing Mississippi River Bridge between La Crosse, Wis., and La Crescent, Minn., to Chernus Constr. Co., 322 Plym. Bldg., Minneapolis, Minn., $25,974. Noted Dec. 3.

STREETS AND ROADS

BIDS ASKED

California — Dec. 30, by State Hy. Comn., Sacramento, grading, concrete surfacing 14.6 mi. road between Tecate Divide and Mountain Springs Grade, San Diego and Imperial Co.

Calif., Los Angeles—Bd. P. Wks., City Hall, received no bids Dec. 9, grading, curbing, sewers, guard rail, water services, retaining walls, removing old curb, wooden stairways, bridge, trees, and 6 in. concrete paving 170,216 sq.ft. Oakden Dr. and Jewett Dr. Impvt. Dist. To exceed $25,000. Matter of re-advertising has been taken under advisement by owner, J. J. Jessup, City Hall engr.

Calif., San Francisco — Dec. 30, by S. J. Hester, secy. Bd. P. Wks., City Hall, grading, curbing, cutting, asphaltic concrete paving 85,925 sq.ft. Dewey Blvd. from Laguna Honda to Taraval St.

Calif., San Francisco—Dec. 30, by S. J. Hester, secy. Bd. P. Wks., City Hall, grading, embankment, curbing, guttering, sidewalks, asphaltic concrete paving 17,200 sq.ft. Delong St., between Orizaba and Head Sts.

Kansas—Dec. 29, by State Hy. Comn., at office engr. First Division, Masonic Temple, Topeka (**P. means Project**), sand gravel surfacing 15.2 mi. P. 4-22-7509, Wabaunsee Co.—7.5 mi. P. 10-9-7510, Shawnee Co.—0.5 mi. P. 11-14-7511—6 mi. P. 11-15-7512, both Lyon Co.—5.1 mi. P. 16-13-7513, Atchison Co.—4.1 mi. P. 35-35-7514, Doniphan Co.—sand gravel or chats surfacing 9 mi. P. 508-39-7515, Osage Co.—1.6 mi. P. 77-19-7516, Geary Co. W. V. Buck, hy. engr.

Kentucky—Jan. 12, by State Hy. Dpt., Frankfort, surfacing 1.4 mi. Covington-Erlanger Rd. (U. S. Hy. 25), from Covington city limits to point 4.2 mi. north of Erlanger, Kenton Co.—2.5 mi. same road from point 4.2 mi. north of Erlanger to point 1.7 mi. north of Erlanger, B. Johnson, chn.

Maryland—Dec. 29, by State Roads Comn., Baltimore, G. C. Uhl, chn., sheet asphalt paving 0.6 mi. Contr. BC-111-74, Baltimore City; gravel surfacing 2.69 mi. Contr. C-42-84, Calvert Co.; adv. E.N.-R. Dec. 24.

Michigan—Dec. 29, by H. W. Hagaman, div. engr., 208 Kresge Bldg., Port Huron, 30 ft. concrete widening, capping existing pavement 16,606 mi. MO77-4C-4, St. Clair Co., for State Hy. Comn., Lansing.

Michigan—Dec. 29, by W. J. Kingscott, div. engr., 213 Watson Bldg., Grand Rapids, grading, drainage structures 2.124 mi. MO62-27C-1, Newaygo Co., for State Hy. Comn., Lansing.

Michigan—Dec. 30, by H. W. Hagaman, div. engr., 504 Eddy Bldg., Saginaw, grading, drainage structures 3 mi. F.O.56-15-C-4, Midland Co., for State Hy. Comn., Lansing.

Mo., St. Louis—O. H. Olfe, engr., 6460 Lindenwood St., taking bids, curbing, rein.-con. paving 2 blocks Winona and Chippewa Sts.

New Jersey—Jan. 11, by State Hy. Comn., Trenton, steel work for deck highway structure between Newark Ave., Jersey City and westerly side Hackensack River, Kearny, Route 25, Connecting Link, Sects. 2 and 3, Contr. 55—for Sects. 4A, 4B, 5 and 6 same road Contr. 57—for Sects. 7, & 7A and 8, Contr. 59—concrete deck slab and sidewalks on highway structure Route 25, Connecting Link Sects. 2 and 3, Contr. 58—Sects. 4A, 4B, 5 and 6, Contr. 60—Sects. 7, 7A and 8, Contr. 61, Hudson Co.; adv. E. N.-R. Dec. 24.

New Mexico—Jan. 7, by W. R. Eccles, state hy. engr., Santa Fe, grading, Maricopa type concrete paving 1.6 mi. F.A.P. 176-A, Dona Ana Co.—1 mi. F.A.P. 168-A, Grant Co.—grading, crushed gravel base course surfacing 10.4 mi. F.A.P. 8, Chanez Co., for State Hy. Comn., Santa Fe.

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Streets and Roads (Continued)

New York—Jan. 8, by A. W. Brandt, comr. Hys., Albany, constructing, reconstructing hys. in Nassau, Queens and Suffolk Counties; adv. E. N.-R. Dec. 24.

O., Cincinnati—Jan. 5, by Comrs. Hamilton Co., grading, tar bound macadam paving 8,438 ft. McKelvey Rd. from Grove to Brower Rds., 16 ft., $28,985; 18,562 ft. Laurenceburg Rd. from I.C.H. 42 to Kilby Rd., 16 ft., $60,290. E. A. Gast, Court House, engr.

Virginia—Jan. 5, by State Hy. Dpt., Richmond, clearing, grubbing, grading, drainage structures 3.3 mi. Pedlar River-Rockbridge County Line Rd., Route 13, Project F-555-CB1, Amherst Co., incl. 20 ft. bridge over Pedlar River — clearing, grubbing, grading, drainage structures, gravel, top soil or macadam surfacing 4.8 mi. Tuckahoe Creek-Manakin Rd., Route 19, Project S-719-AB, Goochland Co., incl. 20 ft. bridge over Tuckahoe Creek — grading, drainage structures, gravel or macadam surfacing 3.8 mi. Page County Line-Elkton Rd., Route 815, Project S-740-AB1, Rockingham Co., incl. 20 ft. bridge over Dry Run River—three 40 ft. span rein.-con. beam span bridge over Bent River, near Caskie, Route 307, Sect. S-658-B6, Appomattox Co. H. G. Shirley, ch. engr.

Washington — Jan. 5, by S. J. Humes, dir. Hys., Olympia, grading, crushed stone surfacing 2.6 mi. State Rd. 12, Fort Columbia to Point Ellice Pacific Co.; 6.9 mi. State Rd. 15, Index to Gold Bar, Snohomish Co.

Wash., Seattle—Comrs. King Co. bids about Feb. 7, concrete paving 2.3 mi. Julia Blvn Rd., $85,000; 2 mi. Lake Sammamish West Shore Rd., $42,000. T. D. Hunt, Seattle, co. engr.

West Virginia—See "Bridges."

Que., Montreal—Metropolitan Comn., 14 St. James St., soon takes bids asphalt surfacing 35 mi. Trans Island Blvd., 60 ft. wide with 10 ft. crushed stone shoulder on both sides, $14,028,000. Included in the amount is $3,817,000 for tunnels, bridges. J. E. Blanchard, ch. engr.

Que., St. Jerome—Soon takes bids paving streets. $54,000.

CONTRACTS AWARDED

Arizona—State Hy. Comn., Phoenix, grading, bridging 2.8 mi. Holbrook-Lupton Rd., Navajo Co., to Canion & Royden, P. O. Box 865, Phoenix, $57,489—22 mi. Florence-Tucson Rd., Pinal Co., to New Mexico Constr. Co., Albuquerque, N. M., $142,924.

California—Healey-Tibbitts Constr. Co. (contractors), 64 Pine St., San Francisco, sub-let contract grading, oil treated material surfacing road between Devon and Alray, San Bernardino Co., to J. P. Holland, Inc., 1834 McKinnon Ave., San Francisco, for State Hy. Comn., Sacramento. Noted Oct. 29.

California—C. H. Purcell, engr. State Hy. Comn., Sacramento, grading, untreated crushed gravel or stone surfacing 0.9 mi. Dyerville Bridge Approaches Humboldt Co., to Young & Son Co., 599 Colusa Ave., Berkeley, $30,584; grading, concrete surfacing 0.6 mi. at Madera, Madera Co., to Valley Paving & Constr. Co., P. O. Box 1349, Fresno, $31,554. Noted Dec. 3.

Calif., San Diego—San Diego Co., grading, realignment 1 mi. road around Hodges Dam, incl. 2 small bridges requiring 173 cu.yd. concrete, to Yglesius Bros., 1810 South 32nd St., $18,500; grading, widening, rebuilding 14,337 ft. Torrey Pines Mesa Hy., to M. D. Goodbody, 1365 3rd St., $14,250.

Calif., San Gabriel — Bradbury Estate, 433 South Spring St., Los Angeles, grading, 3 in. asphaltic concrete paving Leslie Dr. et al., to Hall-Johnson Co., 905 Westminster Ave., Alhambra, $25,650.

Calif., Ventura—Directors Joint Hy. Dist. 6, Ventura Co., Court House, improving Casitas Pass Div. of Ojai-Carpenteria Hy., to Macco Constr. Co., 815 Ocean Ave., Clearwater, $28,352. Noted Dec. 3.

Idaho—A. Harbour, comr. P. Wks., Boise, grading, crushed rock surfacing 4.036 mi. Palouse Hy., Kootenai Co., to Wheeler & Ingram, Moreland, $68,831; 11.032 mi. Boise Valley Hy., Ada and Canyon Counties, to Triangle Constr. Co., 122 Ide St., Spokane, Wash., $30,279. Noted Dec. 3.

Michigan—A. L. Burridge, div. engr. Cadillac, grading, drainage structures 7.071 mi. MO10-16C-1, Benzie Co., for State Hy. Comn., Lansing, to Golden & Boter Transfer Co., Grand Rapids, $79,918. Noted Nov. 26.

Michigan—A. L. Burridge, div. engr. Cadillac, grading, shaping drainage structures, gravel surfacing 0.568 mi. FO35-19C-1 16 ft., Iosca Co., for State Hy. Comn., Lansing, to C. A. Tenniswood, Yale, $11,032. Noted Nov. 26.

Michigan—A. L. Burridge, div. engr., Cadillac, grading, shaping, drainage, 16 ft. gravel surfacing 1.512 mi. MO43-11C-1, Lake Co., for State Hy. Dpt., Lansing, to Lake County Road Comn., Baldwin, Mich., $18,325. Noted Nov. 12.

Michigan—W. J. Kingscott, div. engr., 213 Watson Bldg., Grand Rapids, grading, shaping, concrete surfacing 0.199 mi. MO41-30C-6, Kent Co., for State Hy. Dpt., Lansing, to E. J. Vanderveen, Grand Rapids, $22,831, incl. cement. Noted Nov. 12.

Michigan—W. J. Kingscott, div. engr., 213 Watson Bldg., Grand Rapids, grading, drainage structures 2.613 mi. MO41-15C-3, Kent Co., for State Hy. Dpt., Lansing, to C. F. Light Constr. Co., St. Johns, Mich., $21,940. Noted Nov. 26.

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Michigan—W. J. Kingscott, div. engr., 213 Watson Bldg., Grand Rapids, grading drainage structures 4.507 mi. MO62-9C-1, Newaggo Co., for State Hy. Comn., Lansing, to Millard & Sikkenga, Twin Lake, $16,829. Noted Nov. 26.

Michigan—W. J. Kingscott, div. engr., 309 McNair Bldg., Kalamazoo, grading, shaping, drainage structures, concrete surfacing 0.456 mi. MO39-22C-1, Kalamazoo Co., for State Hy. Comn., Lansing, to Kalamazoo Constr. Co., Kalamazoo, $22,259. Noted Nov. 26.

Michigan—W. J. Kingscott, div. engr., 213 Watson Bldg., Grand Rapids, widening, lengthening, grading, drainage structures 7.17 mi. MO41-55-C-1, Kent Co., to Marsmen & Taber, Grand Rapids, $40,578. Noted Nov. 26.

Mo., Clayton—St. Louis Co., bituminous surfacing Strodtman Rd., to J. Dillon, 2358A Tennessee Ave., St. Louis, $29,072.

N. J., Freehold—Monmouth Co., Court House, grading, bridging, 9 in. rein.-con. paving road Route 36, Sect. 2, Keansburg-Atlantic Highlands, to J. F. Lafferty, Haddon Heights, $261,540. Noted Nov. 5.

N. Y., New York—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., grading, curbing, sidewalks on Matilda Ave., to S. LaBarbera, 65 Webster Ridge, New Rochelle, $19,720; Patterson Ave., to Mansbro Contg. Co., 3283 Westchester Ave., $7,044. Noted Dec. 3.

N. Y., New York—S. Levy, pres. Manhattan Boro, Municipal Bldg., superstructure highway on 12th Ave. Contr. 8, Sect. 1, Div. 2, from West 22nd to West 38th Sts., to Poirier & McLean eCorp., Lexington Ave. and 77th St., $1,655,237. Noted Dec. 3.

Texas—G. Gilchrist, state hy. engr., Austin, concrete paving 16.998 mi. Victoria Co., to Arcola Constr. Co., Richland, $200,596 est. $260,000—two course limestone rock on concrete base surface treating 11.896 mi. Bee and San Patricio Counties, to S. & H. Constr. Co., 92 Mason St., Milwaukee, Wis., $207,323 est. $200,000—grading, drainage structures, triple asphalt on caliche base surface treating 20.004 mi. Gaines Co. and double bituminous on caliche base course surface treating 14.697 mi. Crosby and Dickens Counties, to Field Bros. & McCelvey, 308 Myrick Bldg., Lubbock, $146,824 and $71,220 respectively, est. $200,000 and $100,000 respectively, all foregoing 18 ft. wide—grading, drainage structures 12.767 mi. Culberson Co. and 12.156 mi. Brewster Co., to Hannah Constr. Co. and F. and D. Hall, Box 994, Waco, $42,305 and $60,808 respectively est. $60,000 and $76,000 respectively—15.785 Gonzales Co. to D. F. Jones Constr. Co., Little Rock, Ark., $66,955 est. $80,000—7.51 mi. Ellis Co., to E. G. Powell, Box 998, Jacksonville, $17,064 est. $40,000—2.215 mi. Pecos Co. to Thomas & Simpson San Angelo $28,288 est. $36,000—15.933 mi. Throckmorton Co., to R. E. Stroup, Vernon, $45,440 est. $60,000, all foregoing 26 ft. wide. Grand total $886,824.

Virginia—State Hy. Dpt., Richmond, clearing, grubbing, grading, gravel surfacing 5.028 mi. Route 19, Henrico Co., to N. L. Teer, Durham, N. C., $38,249—bridge over Lulatto Creek, Route 16, Madison Co., to Alley Constr. Co., Bristol, $7,769 — grading, drainage structures Route 12, Isle of Wight and Southampton Counties, to Fredericksburg Bridge Co., Fredericksburg, $15,180. Grand total $61,198. Noted Dec. 3.

Va., Martinsville—See "Factories and Mills."

Wisconsin—State Hy. Comn. and Walworth and Kenosha Counties, Madison, Lien Grade Separation (approaches only), to E. F. Gust Co., Oshkosh, $16,174; Genz Grade Separation (approaches only) to Lex Constr. Co., West Allis, $26,166.

Wyoming — State Hy. Comn., Cheyenne, crushed shale surfacing 9.174 mi. Campbell Co., to S. F. Ronde Sheridan, $9,750 — grading, base course surfacing 3,041 mi. Laramie Co. and bridge in Big Horn Co., to Northwestern Eng. Co., Rapid City, N. D., $22,045 and $12,800 respectively—grading, bridging 2.351 mi. Laramie Co. to Bedford & Woodman, Chepenne. $21,525. Grand total $66,526.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

N. J., Little Falls—Passaic Valley Water Comn., 156 Ellison St., Paterson, excavating, dredging 10,000 cu.yd. dirt in river and tail races. $25,000. Fuller & Everett, 25 West 43rd St., New York, engrs.

Bond Elections

Coming Bond Elections

Waterworks Impvts—Moline, Ill., Jan. 26, $350,000. G. Johnson, Chm. Water Com.

Waterworks and Distribution System—Sewers and Disposal Plant, Deepwater, Mo., Jan. 5, $52,500.

Bonds Voted

Artesian Water Supply, Water Tank on Tower—St. Louis Park, Minn., $20,000. Alexander & Bradley, Minneapolis, Engr.

Bridge—Chisholm, Minn., $50,000. O. A. Borlin, clk.

High School—King Ferry, N. Y., Central School Dist., $170,000.

Bonds Defeated

Waterworks, Sewers, Bridge and Road Impvts.—Vancouver, B. C., $1,240,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Ala., Mobile—HOSPITAL—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by Warren, Knight & Davis, Protective Life Bldg., Birmingham, and bids about January, U. S. Marine Hospital. $450,000. Noted Oct. 1.

California — BRIDGE — U. S. Eng., Sacramento, returned bids to have been opened Dec. 10, bridge across dredge cut, west side Yolo By-Pass, Solano Co. Project postponed indefinitely. Noted Dec. 4.

Calif., Alameda—BRIDGE—Pub. Rds., 461 Market St., San Francisco, reconstructing 800 ft. timber trestle at Government Island. C. H. Sweetser, 461 Market St., San Francisco, dist. engr.

Calif., Los Angeles—DREDGING—U. S. Eng., 100,000 cu.yd. in Los Angeles Outer Harbor.

Fla., Jacksonville—JETTIES—U. S. Eng., repairing North and South jetties at entrance Hollywood (Port Everglades), incl. 10,211 tons stone.

Kan., Wichita—HOSPITAL—Vet. Bu., Arlington Bldg., Wash., D. C.; U. S. Veteran's Hospital, Oliver and Kellogg Sts. $750,000. Site purchased.

Mich. Frankfort — BREAKWATER and DREDGING—U. S. Eng., Milwaukee, Wis., 1,972 lin.ft. north breakwater; dredging 125,000 cu.yd. from entrance channel, Frankfort Harbor.

Minn., Sandstone—PRISON—U. S. Bureau Prisons, S. Bates, superv., prison farm. $250,000.

N. J., Rutherford—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., 2 story, basement, brick, steel U. S. Post Office. $185,000. **Maturity 1932.**

New York, New Jersey and Connecticut — DREDGING—U. S. Eng., Whitehall St., New York, plans improving and maintenance dredging in East Rockaway Inlet, Jamaica Bay, New York Harbor, Bay Ridge and Red Hook Channels, East River, Newtown Creek, Hudson River Channel, Hudson River, New York and New Jersey Channels, Newark Bay, Hackensack and Passaic River, collecting drift in New York Harbor, all foregoing in New York; Newark Bay, Hackensack and Passaic Rivers, New York and New Jersey Channels, Raritan River, Washington Canal and South River, Shrewsbury River and Manasquan River, all foregoing in New Jersey; in Pawcatuck River, New London Harbor, Connecticut River, below Hartford, New Haven Harbor, Bridgeport Harbor and Stamford Harbor, all foregoing in Connecticut. $5,347,000. Appropriation pending. **Maturity in spring.**

Ore., Oregon City—FEDERAL BUILDING—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by Knighton & Howell, U. S. Bank Bldg., Portland, U. S. Post Office and Court House, 5th and Main Sts. $150,000.

Va., Hampton Roads—BUILDINGS—Yards & Docks, Navy Dpt., Wash., D. C., bids in January, moving several buildings so as to give larger landing field at air station. $150,000.

Va., Norfolk—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., soon takes bids 4 story, basement, brick, steel, concrete, limestone, $2,000,000. B. F. Mitchell, Arcade Bldg., W. C. Taylor, City Bank Bldg., and Rudolph, Cooke & Van Leedwen, Arcade Bldg., archts. Noted Nov. 26.

Wis., Algoma—PIERS—U. S. Eng., Milwaukee, 1,948 lin.ft. concrete superstructure on crib and pile piers at Algoma Harbor, etc.

Wis., Alma—LOCK—U. S. Eng., 615 Commerce Bldg., St. Paul, Minn., rescinded call for bids to have been opened Dec. 17, lock and dam in Mississippi River, because of federal court order. Noted Nov. 26.

BIDS ASKED

HOISTING ENGINE—Bids will be opened in January for 1 hoisting engine, steam, without boiler, single-drum non-reversing. 22 additional hoisting engines, same specifications may be ordered within 60 days. For details address Business News Dept., Engineering News-Record.

Calif., Alameda—TANK—Jan. 4, by Con. Q. M. Benton Field, 200,000 gal. steel water tank at Benton Air Depot.

Calif., Mare Island—BATTERY OVERHAUL SHOP—Spec. 6431—Jan. 6, by Yards & Docks, Navy Dpt., Wash., D. C., overhauling Building 20, Navy Dpt. Noted Dec. 10.

Calif., Palo Alto—TANK—Jan. 11, by Supervising Superintendent Constr., U. S. Vet. Hospital, steel water tank and tower, incl. piping, valves, appurtenances, at U. S. Veterans' Hospital.

Calif., San Francisco—PIPE—Jan. 11, by Con. Q. M. General Depot, Fort Mason, 89,000 ft. ¾ to 1½ in. wrought iron pipe, butt welded, galvanized standard weight.

Calif., San Francisco—ROAD MARKERS—Jan. 6, by U. S. Forest Serv., Ferry Bldg., 2,255 metal porcelain enamel road and trail markers.

Ga., Americus—POST OFFICE—Jan. 11, by Treas. Dpt., at office Sup. Archt., U. S. Post Office.

Federal Government (Continued)

Ga., Augusta—REMODELING, etc.—Jan. 4, by Treas. Dpt. at office Sup. Archt., Wash., D. C., remodeling, extending U. S. Post Office; adv. E. N.-R. Dec. 24.

Ind., Connersville—POST OFFICE—Jan. 6, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. Noted July 9.

Miss., Vicksburg—WIRE ROPE—Dec. 28, by U. S. Eng., Box 667, steel wire rope.

Mo., Kansas City—PONTONS, etc.—Jan. 4, by U. S. Eng., 707 Postal Telegraph Bldg., 20 steel pontons with pivot bearing pipe carriers, 20 sections electric welded 34 in. inside diam. steel pipe with steel flanges on each end except as noted in specifications, 4 cast steel elbows, 2 wrought steel nipples, 4 connecting bars, 2 deflector plates and 2 capstans.

N. Y., Brooklyn—GENERATOR SET—Jan. 4, by Signal Supply Officer, Army Base, 58th St. and 1st Ave., 3 unit motor generator set.

N. C., Wadesboro—POST OFFICE—Jan. 5, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. Noted Nov. 19.

N. D., Grafton—POST OFFICE—Jan. 19, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office; adv. E. N.-R. Dec. 24.

O., Gallipolis—POST OFFICE—Jan. 4, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office; adv. E. N.-R. Dec. 24.

O., Zanesville—POST OFFICE, etc.—Jan. 6, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office, elevator; adv. E. N.-R. Dec. 24.

Pa., Braddock—REMODELING, etc.—Jan. 5, by Treas. Dpt. at office Sup. Archt., Wash., D. C., remodeling, enlarging U. S. Post Office; adv. E. N.-R. Dec. 24.

Pa., McKeesport—ELEVATOR—Dec. 30, by Treas. Dpt. at office Sup. Archt., installing freight elevator in U. S. Post Office.

Va., Hampton—ADMINISTRATION BUILDING—Dec. 28, by Vet. Bu., Arlington Bldg., Wash., D. C., administration home barrack building, at U. S. Veterans' Hospital.

W. Va., Huntington—CASTINGS—Jan. 4, by U. S. Eng., castings for gate operating machinery delivered at locks on Ohio River, at Morgan, Ravenswood, Millwood, York and Guyandot.

CONTRACTS AWARDED

Ala., Mobile—WHARF—Treas. Dpt. at office Sup. Archt., Wash., D. C., quarantine station wharf, to J. W. Gilbert, 57 Bradford Ave., Mobile, $26,776. Noted Dec. 3.

Idaho—BRIDGE—Pub. Rds., Dpt. Agriculture, Ogden, Utah, bridge on North Fork-Payette Hy., Boise Co., to C. F. Dinsmore & Co., Ogden, Utah, $30,292. Est. $40,453. Noted Dec. 3.

Ind., Greensburg—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., 2 story, basement, 58 x 96 ft., U. S. Post Office, to Dunlap & Co., Columbus. Noted Nov. 12.

Kan., Kansas City—DIKES—U. S. Eng., 700 Postol Telegraph Bldg., Kansas City, Mo., 8,010 ft. dikes in Missouri River, at Quandaro and Kansas City Bends to Mossman Constr. Co., 519 Amer. Bank Bldg., Kansas City, Mo., $302,515. Noted Oct. 29.

Kan., Leavenworth—PILE CLUMP DIKES—U. S. Eng., 700 Postal Telegraph Bldg., Kansas City, Mo., 12,760 lin.ft. standard pile clump dikes 6 mi. from here, to A. W. Farney, Armour Bldg., North Kansas City, Mo., $235,728. Noted Nov. 12.

La., Shreveport—ROADS—U. S. Eng., gravel roads Barksdale Air Field, to J. B. McCrary Corp., Citizens & Savings Bank Bldg., Atlanta, Ga., $53,053.

La., Shreveport—DRAINAGE SYSTEM—Con. Q. M. drainage system, incl. 125,000 ft. underground pipe, to Kirkwood, Wharton & Lee, 523 North Flores St., San Antonio, Tex., $60,597.

La., Shreveport—HEADQUARTERS BUILDING—Con. Q. M., headquarters building, Barksdale Field, to W. C. Sallery, Monroe, $56,394. Noted Nov. 5.

Minn., St. Paul—CLEARING—U. S. Eng., 615 Commerce Bldg., clearing 5,139 acres in pool area above Mississippi River, Lock and Dam 2, at Hastings, Sects. 1 to 4 (inclusive) to Twin City Barge & Gravel Co., 817 Hennepin Ave., Minneapolis, $125,000; Sect. 5, to Lahar Constr. Co., Booneville, Ky., $20,550; Sect. 6, to Megarry Bros., Bain, $6,240; Sect. 7, to DeJock Bros., Siren, Wis., $2,760. Grand total $154,550. Noted Oct. 15.

Missouri—CLUMP DIKES, etc.—U. S. Eng., 700 Postal Telegraph Bldg., Kansas City, 5,120 ft. dikes and 2,100 ft. revetment in Missouri River, Malta Bend, to W. A. Ross Constr. Co., 25th and Summitt Sts., Kansas City, $184,926. Noted Oct. 22.

Missouri—CLUMP DIKES—U. S. Eng., 700 Postal Telegraph Bldg., Kansas City, 5,200 lin.ft. dikes at Missouri River, Moberly Bend and Waverly Reach, Waverly Bend, to Kansas City Bridge Co., 510 Orear Leslie Bldg., Kansas City, $167,793. Noted Oct. 22.

Mo., Booneville—CLUMP DIKES— U. S. Eng., 707 Postal Telegraph Bldg., Kansas City, 6,890 lin.ft. standard pile clump dikes, in Missouri River, at Robinson Bend, to C. W. Hunter, 177 South Front St., Memphis, Tenn., $189,881. Noted Oct. 29.

Mo., Springfield—HOSPITAL—Treas. Dpt. at office Sup. Archt., Wash., D. C., hospital for defective delinquents, to J. A. Holpuch Co., 401 West Madison Ave., Chicago, Ill., $1,710,000. Noted Nov. 19.

O., Chillicothe—REFRIGERATION PLANT—Vet. Bu., Arlington Bldg., Wash., D. C., refrigerating and ice making plant, to York Ice Machine Corp., 1328 North 44th St., Phila., Pa., $20,656.

Okla., Fort Sill—HANGAR—Con. Q. M., concrete, brick, steel air corps hangar with annexes, boiler house annex, to Harman Eng. Co., 844 North Rush St., Chicago, Ill., $55,370. This corrects report in Dec. 10 issue.

Pa., Uniontown—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., general contract 1 and 2 story, basement, mezzanine, 81 x 110 ft., brick, stone, terra cotta, to C. H. Shook, Inc., 3rd Natl. Bank Bldg., Dayton, O., $100,700. Noted Nov. 12.

R. I., Melville—TANK—Spec. 6681—Yards & Docks, Navy Dpt., Wash., D. C., 90,000 gal. steel tank, to Chicago Bridge & Iron Wks., 1616 Walnut St., Phila., Pa., $3,680. Noted Dec. 10.

Wyo., Thermopolis—FEDERAL BUILDING—Treas. Dpt. at office Sup. Arct., Wash., D. C., federal building, to J. Parr, Chadron, Neb., $69,700. Noted Oct. 29.

FEDERAL POWER COMMISSION

Applications for License and Permits Licenses

1180—California Oregon Power Co., 58 Sutter St., San Francisco, Calif., wants license partly constructed transmission line affecting public lands within Josephine Co., Ore.

1181—Western Pacific Railroad Co., 220 Montgomery St., San Francisco, Calif., wants license transmission line within Lassen Natl. Forest, Lassen Co.

1182 — San Joaquin Light & Power Corp., Fresno, Calif., wants license constructed transmission line in Stanislaus and Merced Counties.

1183—Midland Counties Public Serv. Corp., Fresno, Calif., wants license constructed transmission line affecting public lands in Fresno Co.

RAILWAYS

PROPOSED WORK

California — City of Stockton plans 1 mi. trackage (1st unit Belt R.R.) in Boggs Tract in connection with port development in Stockton. B. C. Allin, port dir.

BIDS ASKED

Nevada—Six Companies, Inc., c/o E. T. Kibler, purch. agt., Boulder City, taking bids for electrifying 11 mi. railroad from gravel pit to Hoover Dam, incl. electric locomotives, signals, switchboards; also 12 cableways and hoists across river 12/020 tons capacity; steel form lining for diversion tunnels and pile and trestle bridge over river at gravel pit.

CONTRACTS AWARDED

California—Great Northern R.R. Co., St. Paul, Minn., J. R. W. Davis, ch. engr., round house and shops at Bieber, to A. Guthrie & Co., St. Paul, Minn., and Sherlock Bldg., Portland, Ore. Est. exceeds $40,000.

Pennsylvania—Pennsylvania R.R. Co., Broad Street Station, Phila., T. J. Skillman, ch. engr., awarded contracts in connection with electrifying lines between New York and Washington as follows: Richmond Step-up station at Philadelphia, transmission lines from Step-up station to Frankfort Junction and Tacony, installation of through power supply Shellpot branch, constructing catenary, transmission wire, substation foundations, accompanying structures and equipment between West Yard, Wilmington, Del., Perryville, Back River and Baltimore, Md., also constructing foundations and guw anchors, substation structures, erecting catenary and transmission structures and wires, installing substation equipment, in connection with additional power supply required for operation of through trains between Trenton, N. J., and Wilmington, Del., to Vare Constr. Co., Broad and Vine Sts., Phila., Pa., $2,215,000 and $904,000 respectively; erecting structures, catenary, transmission and substations in connection with electrification between Loudon Park, Baltimore, Md., and Washington, D. C., to Arundel Corp., Pier 2, Pratt St., Baltimore, Md., $1,926,000; erecting structures, catenary, transmission and substations in connection with electrification between Trenton and Millstone Junction, N. J., also structures, catenary, transmission and substations in connection with electrification from Rahway to South Amboy, from Waverly to Greenville, in Waverly Yard, Greenville Yard, at Greenville, substation, on Waverly and Passaic branch, state of New Jersey, to Gibbs & Hill, Inc., Pennsylvania Station, New York, $647,000 and $636,000 respectively; removing center pivot pier, fender pier, timber fenders between fenders piers, rip rap protection for bridge over Delaware River near Trenton, N. J., to Dravo Contg. Co., Neville Island, Pittsburgh, $99,000; bridge over State Hy., Route S-41, Berlin, N. J., to Eugene F. Verga, Bway and Cooper Sts., Camden, N. J., $64,000. Grand total $6,491,000. Contracts awarded latter part November.

SUBWAYS AND TUNNELS

PROPOSED WORK

N. Y., Rockaway Beach—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, plans Rockaway Beach Blvd. line, 10 track mi., from Beach 116th St. to Mott Ave. $7,400,000. Bd. Estimate approved and authorized project.

Calif., Fresno—City Council, bids about January, Belmont Avenue Subway, for City, Fresno Co., Southern Pacific R.R. Co., 65 Market St., San Francisco, G. W. Boshke, ch. engr., and State Hy. Comn., Sacramento, C. H. Purcell, comr., J. L. Vincenz, city engr. $200,000. Noted Oct. 8.

BIDS ASKED

Que., Montreal—See "Streets and Roads."

GRADE CROSSINGS

PROPOSED WORK

N. Y., Andover — Erie R.R. Co., G. S. Fanning, ch. engr., Midland Bank Bldg., Cleveland, O., was directed by P. Serv. Comn. to eliminate Stearns Crossing 1.3 mi. west of here on Wellsville-Andover State Hy. $102,700.

N. Y., Bethany — Delaware, Lackawanna & Western R.R. Co., G. J. Ray, ch. engr., Hoboken, N. J., soon takes bids grade separation at East Mill Rd. Pub. Serv. Comn. approved specifications.

N. Y., Boonville—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, has been directed by P. Serv. Comn., to prepare plans and estimates for eliminating grade crossing at Park St.

N. Y., Brighton — New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, plans approved eliminating Buts Crossing on Adirondack Div., Franklin Co. $50,000. Noted Aug. 20.

N. Y., Clifton Park—Boston & Maine R.R. Co., W. J. Backes, ch. engr., Boston, Mass., and Delaware & Hudson R.R. Co., J. MacMartin, ch. engr., Albany, preliminary plans eliminating Hubbs and Dyers Crossings. Public Serv. Comn. approved site and preliminary plans.

N. Y., Elma—Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad St. Sta., Phila., Pa., plans eliminating Jamison Rd. Crossing, by placing grade Jamison-East Elma County Hy. under grade of railroad, north of Jamison Rd. Sta., by amended order. $170,000.

N. Y., Gainesville — Erie R.R. Co., G. S. Fanning, ch. engr., Cleveland, O., revised specifications and estimates eliminating grade crossing on Warsaw-Gainesville State Hy., south of Rock Glen Station was approved by P. Serv. Comn. $108,700. Noted Sept. 3.

N. Y., Horseheads — Erie R.R. Co., G. S. Fanning, ch. engr., Midland Bank Bldg., Cleveland, O., revised plans and estimates approved by Public Serv. Comn. and soon takes bids eliminating Big Flats Crossing. $55,000. Noted Oct. 15.

N. Y., Ithaca—Lehigh Valley R.R. Co., G. T. Hand, ch. engr., 143 Liberty St., New York, bids early in spring eliminating School House and Burts Crossings $3,640,000. Pub. Serv. Comn. approved acquiring land and estimated cost. Noted July 2.

N. Y., Murray—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating Albion St. Crossing. Pub. Serv. Comn. directed acquisition of land. **Maturity soon.**

N. Y., Poughkeepsie—New York Central R.R., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, was ordered by P. Serv. Comn. to reconstruct highway bridge carrying Union and John Sts. over railroad tracks. $59,300. Noted Oct. 16.

N. Y., Salamanca — Erie R.R. Co., G. S. Fanning, ch. engr., Midland Bank Bldg., Cleveland, O., soon takes bids eliminating grade crossing Wildwood Ave. $45,000. P. Serv. Comn. approved acquisition of land and estimated cost of $43,675.

N. Y., Southampton—Long Island R.R. Co., A. C. Watson, ch. engr., Pennsylvania Sta., New York, plans and specifications in progress eliminating grade crossing Snake Hollow Rd.

N. Y., Wallkill—Erie R.R. Co., G. S. Fanning, ch. engr., Midland Bank Bldg., Cleveland, O., reconstructing highway bridge carrying Middletown-Bloomingburg State Hy. over railroad tracks, Orange Co. $77,850.

N. Y., Woodbury — Erie R.R. Co., G. S. Fanning, ch. engr., Midland Bank Bldg., Cleveland, O., reconstructing bridge carrying railroad over Central Valley-Turners County Hy., Orange Co. $106,000.

CONTRACTS AWARDED

Md., Baltimore—See "Railways" under Pennsylvania.

Utah—State Hy. Comn., Salt Lake City, overhead crossing, at Death Curve, to Young & Ogden, Richfield, $40,382. Est. $50,735. Noted Dec. 4.

DAMS

BIDS ASKED

Kan., Manhattan—See "Contracts Awarded."

CONTRACTS AWARDED

Kan., Manhattan — United Power & Light Corp., A. Groesmeck, dist. mgr., repairing undermined dam and retaining walls, own forces. $25,000.

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PIERS AND WHARVES

CONTRACTS AWARDED

Calif., San Francisco—PIER—Bd. of State Harbor Comrs., Ferry Bldg., 170 ft. timber extension to Pier 44, incl. creosoted piles, to Clinton Constr. Co., 923 Folsom St., San Francisco, $73,400. Noted June 19.

POWER AND LIGHTING

PROPOSED WORK

Calif., San Mateo—City, E. P. Wilsey, mgr., electrolier system in Hayward Park Section. $25,000.

N. Y., Butler—Rochester Gas & Electric Corp., 89 East Ave., Rochester, electric distribution system.

N. Y., Coventry—New York State Gas & Electric Corp., Central Ave., Ithaca, applied to Pub. Serv. Comn. for permission to construct electric distribution system and plants. To exceed $25,000.

N. Y., Edwards — Urban P. Webb granted franchise by Pub. Serv. Comn., electric distribution system.

N. Y., Sodus—See "Power Plants."

N. Y., Spofford—See "Factories and Mills."

N. Y., Woodhull—See "Power Plants."

Oklahoma—Oklahoma Gas & Electric Co., 321 North Harvey St., Oklahoma City, 23,000 volt transmission line from Shawnee to Tecumseh, $25,000. Byllesby Eng. Co., 231 South La Salle St., Chicago, Ill., engrs.

BIDS ASKED

Va., Waynesboro—See "Contracts Awarded."

CONTRACTS AWARDED

Pennsylvania—See "Railways."

Va., Waynesboro—City, I. G. Vass, city mgr., constructing "Whiteway" lighting system, day labor, under supervision Virginia Pub. Serv. Corp., owners of local electric power distribution. $25,000.

PARKS AND SPORTS

PROPOSED WORK

Mass., Boston — City, Park Dpt., enlarging Mission Hill Playground, Ward 10, $62,000; grading, improvements, at Charlestown Heights Park, Bunker Hill and Medford Sts., Charlestown, $25,000; playground in Parker Hill, Roxbury, $30,000; field house and grading at Dunbar Ave. Playground, Dorchester, $40,000.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, public baths, swimming pools. To exceed $500,000. **Maturity indefinite.** No appropriation.

Ont., Sarnia—See "Unclassified."

BIDS ASKED

N. Y., Brooklyn—Dec. 29, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, grading, asphaltic and flag walks, ten pegolas in North addition, Brooklyn Botanic Garden; repairing sheet asphalt on concrete paving main roadway Eastern Parkway between Grand Army Plaza and Ralph Ave., 1 combined sand box and shelter, 1 double masonry hand ball court, Dyker Beach Park, Sunset Park, unnamed playground 8; Lincoln Terrace Park, and Bushwick Park and 1 combined sand box and shelter in Gravesend Park and Lindsay Park.

N. Y., Long Island City—Dec. 29, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., New York, steel sheet pile bulkhead, Crocheron Park; also plumbing for comfort station, Flushing Park.

N. Y., New York—Dec. 29, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, repairing asphalt walks in Central Park; erecting wrought iron picket fence along west side of Harlem River Driveway, north and south of High Bridge; replacing hydrants and gate valves; galvanized chain link fences with gates around playground in Market St., Downing St., Dyckman St., and in St. Nicholas Park; reconstructing main entrance 77th St. and repaving service road, where directed at American Musem of Natural History.

CONTRACTS AWARDED

N. Y., Long Island City—Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, walks in Kissena Park, to Pan Constr. Co., 244 Jackson Ave., $10,586. Noted Nov. 12.

HEATING AND VENTILATING

PROPOSED WORK

N. J., Haledon — Bd. Freeholders Passaic Co., Court House, Paterson, soon takes bids heating work and system for connecting passages at Valley View Sanatorium, $25,000. F. W. Wentworth, Citizens Trust Bldg., Paterson, engr. Former bids rejected.

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BIDS ASKED

N. Y., Brooklyn—Dec. 28, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., heating, ventilating, plumbing, drainage, lighting fixtures, electrical work for P.S. 248, Avenue U and 86th St., for Bd. Educ., 500 Park Ave., New York.

N. Y., Brooklyn—Dec. 29, W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., heating, ventilating, plumbing, drainage, electrical work and lighting fixtures for P. S. 242, Flatlands Ave. from East 100th to East 101st Sts., Canarsie, for Bd. Educ., 500 Park Ave., New York.

N. Y., Middle Village—Dec. 29, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn; heating, ventilating, plumbing, electrical work and electrical fixtures, for P. S. 49, Penelope Ave. from 79th to 80th Sts., for Bd. Educ., 500 Park Ave., New York.

N. Y., Mount Vernon—Gristede Bros., 1885 Park Ave., New York, heating distribution station, to C. Schneider, 492 East 163rd St., New York. Bids about Jan. 2, electrical and refrigerating work.

N. Y., West Brighton—Dec. 29, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, heating, ventilating, plumbing, drainage, electrical work and electrical equipment, for P. S. 45, Morrison Ave., from Lawrence to Davis Aves., for Bd. Educ., 500 Park Ave., New York.

CONTRACTS AWARDED

N. Y., Central Islip—Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, heating at James Group and Patients Reception Hospital Building, to Astoria Heating Co., 4151 70th St., Woodside, $2,250; equipment Kitchen Building, to A. S. Ruslander & Son, 214 Terrace, Buffalo, $39,485. Noted Oct. 29.

N. Y., Napanoch—Commissioner Correction, State Office Bldg., Albany, heating, electrical work service connections Institute for Defective Delinquents, to W. W. Wetmore, 259 Delaware Ave., Buffalo, $40,883. Noted Oct. 29.

UNCLASSIFIED

PROPOSED WORK

Calif., Sunnyvale—PAVING PLANT—Granite Rock Co., Watsonville, paving plant on 5 acre site.

Illinois, Texas and Wisconsin—PIPE LINE—Continental Constr. Co. (contractor), 20 North Wacker Dr., Chicago, Ill., will not take bids or award contract on pipe and other sub-contracts for 170 mi. natural gas pipe line from Genesco, Ill., to Milwaukee, Wis., until spring, for Cities Service Co., 60 Wall St., New York, Texas Co., 17 Battery Pl., New York, Standard Oil Company of New Jersey, 26 Bway., New York, and Middle West Utilities Co. Noted Nov. 19, under "Contracts Awarded."

Kan., Eldorado—OIL PIPE LINE—Skelly Oil Co., Skelly Bldg., Tulsa, Okla., preliminary plans 8 in. oil pipe line at Eldorado Oil Fields, $25,000. Private plans.

Mass., Boston—PLUMBING—Dpt. Institutions plans plumbing at Deer Island Prison, $90,000.

Mass., Salem—OIL TERMINAL—See "Warehouses."

Mo., St. Louis—SAFETY ZONES—City, Director Streets, City Hall, preliminary plans 144 concrete cone-type pedestrian's safety zones, $47,520; 11 automatic traffic signals, $16,500; minor stop signs and signals, $6,500.

N. Y., Brooklyn—ELEVATORS—Bd. Educ., 500 Park Ave., New York, plans by Otis Elevator Co., 310 Clinton St., New York, altering three 10 story; one 7 and one 4 story elevators, Fort Green Pl. and DeKalb Ave. To exceed $91,000.

Okla., Guthrie—TRANSFORMER STATION—Oklahoma Gas & Electric Co., 321 North Harvey St., Oklahoma City, plans high voltage transformer station, $25,000. Byllesby Eng. Co., 231 South La Salle St., Chicago, Ill., engrs.

Ont., Sarnia — LAND DEVELOPMENT — Frank S. Salter Co., 1707 Washington Boulevard Bldg., land development in Bosanquet Twp., incl. golf course, waterworks, sewers, buildings, $600,000.

BIDS ASKED

Mo., St. Louis—COMFORT STATION—See "Sewers."

N. Y., Brooklyn—STATION FINISH—Dec. 29, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, station finish for Smith-9th St. and 4th Ave. Stations Rapid Transit R.R. Noted Nov. 26.

N. Y., Napanoch—ELEVATORS—Jan. 5, by Commissioner Correction, State Office Bldg., Albany, electric elevators in storehouse and industrial shop, Institution for Defective Delinquents; adv. E. N.-R. Dec. 24.

N. Y., New York—ELEVATORS—Dec. 30, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, elevators in Higgins Building, Kitchen 2, Old Branch Building, Dining Room 8, Manhattan State Hospital, Wards Island; adv. E. N.-R. Dec. 24.

N. Y., Nissequoque — GAS DISTRIBUTION SYSTEM—See "Contracts Awarded."

N. Y., Ogdensburg—REFRIGERATION WORK—Dec. 30, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, refrigeration work at St. Lawrence Hospital; adv. E. N.-R. Dec. 24.

N. Y., Wallkill—ELEVATORS—Jan. 5, by Dpt. Correction, State Office Bldg., Albany, electric and hand lift elevators, at Medium Security Prison; adv. E. N.-R. Dec. 24.

N. Y., Wingdale—REFRIGERATION—Jan. 6, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, refrigeration work in Building C, Harlem Valley State Hospital; adv. E. N.-R. Dec. 24.

CONTRACTS AWARDED

N. Y., Nissequoque — GAS DISTRIBUTION SYSTEM—Long Island Lighting Co., 50 Church St., New York, gas distribution system, Suffolk Co., day labor.

MATERIALS

PROPOSED WORK

PIPE—**Albany, Calif**—City purchasing 2,000 lin.ft. 18 in. vitr. pipe for outfall sewers. H. Dygert, city engr.

LUMBER—**St. Louis, Mo.**—Bd. P. Serv., City Hall, soon takes bids 3,500,000 Southern pine ties and other timber for constructing railroad approaches to St. Louis Municipal Bridge across Mississippi River, between St. Louis, Mo., and East St. Louis, Ill. $225,000.

BIDS ASKED

CHLORINE—**Anaheim, Calif.**—Jan. 2, by City Countil 26 tons chlorine for use in sewerage system.

CAST IRON PIPE—**El Centro, Calif.**—City Council taking bids carload c.i. pipe for waterworks.

CONCRETE PIPE—**Oakland, Calif.**—J. H. Kimball, secy. East Bay Municipal Dist., taking bids 600 ft. 36 in. rein.-con. pipe for waterway Lafayette Reservoir.

CULVERT PIPE, etc.—**Leon, Ia.**—Jan. 12, at office Auditor Decatur Co., 4,760 lin.ft. corrugated culvert pipe, miscellaneous hardware, 2,050 ft. red cedar piling, 4,380 ft. creosoted yellow pine piling, 48,000 ft. treated bridge lumber, 268,000 ft. untreated bridge lumber. Address County Engineer or Auditor.

LUMBER, PILING, etc.—**Mount Ayr, Ia.**—Dec. 30, at office Auditor Ringgold Co., 2,592 ft. treated piling, 21,440 ft. B.M. treated lumber, 30,712 ft. B.M. full sawed lumber, 200,108 ft. B.M. standard-sawed untreated lumber, 33,732 ft. B.M. S4S untreated lumber, also 1,400 ft. corrugated pipe, miscellaneous items of hardware and paint. C. H. Lehmkuhl, Mount Ayr, engr.

LUMBER—**St. Louis, Mo.**—See "Bridges."

CHLORINE, etc.—**White Plains, N. Y.**—Dec. 30, by Westchester Co. Sanitary Sewer Comn., White Plains, chlorine, fuel oil, lubricants and greases for sewage plants. W. W. Young, consult. engr.; adv. E. N.-R. Dec. 24.

PIPE, GRAVEL, LUMBER, etc.—**North Braddock, Pa.**—Jan. 4, by J. O. Jones, boro secy., 3,000 ft. 24 in. D.S. terra cotta pipe in 2 ft. lengths and 3,000 ft. 24 in. in 3 ft. lengths, 11 manholes, 3 tons joint compound, 6 tons gravel, 80 manhole steps, 5,000 common brick, 4,000 ft. 2 x 12 and 1,000 ft. 4 x 4 lumber, 20 bbl. cement, 8 tons sand for projected sewer.

PIPE and LIME—**Providence, R. I.**—Dec. 28, by Bd. Contr. & Supply, City Hall, lime for sewage treatment c.i. water pipe and c.i. water pipe cement lined Class B.

CONTRACTS AWARDED

CAST IRON PIPE—**Oakland, Calif.**—J. K. Kimball, secy. East Bay Municipal Utility Dist., 25,000 ft. 8 in. and 20,000 ft. 6 in. c.i. pipe, to American Cast Iron Pipe Co., Balboa Bldg., San Francisco, $15,250 and $8,200 respectively; 25,000 ft. 4 in., to National Cast Iron Pipe Co., 571 Mission St., San Francisco, $8,000. Grand total $31,450.

PIPE—**Pasadena, Calif.**—City Council, furnishing 2,600 lin.ft. 30 in. centrifugal cast rein.-con. pressure pipe to withstand 50 ft. head, 1,700 lin.ft. 30 in. to withstand 75 ft. head, 1,100 lin.ft. 30 in. to withstand 100 ft. head, also 30 in. x 24 in. concrete lined steel reducer and various fittings, elbow, other outlets, to American Concrete & Steel Pipe Co., 4635 Firestone Blvd., Los Angeles, $18,504.

PIPE—**Santa Cruz, Calif.**—City Council, 2,000 ft. 14 in. welded pipe (replacement in water system), to California Corrugated Culvert Co., 629 Market St., San Francisco, $2,227. Noted Dec. 3.

PIPE—**Colorado Springs, Colo.** — City, c/o E. H. Mosely, mgr., 2,000 tons 24 in. c.i. pipe for 2.5 mi. pipe line, to Minnequa Plant, Colorado Fuel & Iron Co., Pueblo. Est. $70,000.

CEMENT—**Indiana**—State Hy. Comn., Indianapolis, J. J. Brown, dir., 237,000 bbl. cement as follows: 5,000 bbl., to Alpha Cement Co., Easton, Pa.; 10,000 bbl., to Consolidated Cement Corp., 320 Dwight Bldg., Kansas City, Mo.; 5,000 bbl., to Kosmos Portland Cement Co., Starks Bldg., Louisville, Ky.; 33,000 bbl., to Lehigh Cement Co., Allentown, Pa.; 33,000

Materials (Continued)

bbl., to Louisville Cement Co., Speed Bldg., Louisville, Ky.; 15,000 bbl., to Meduso Portland Cement Co., Engineers Bldg., Cleveland, O.; 33,000 bbl., to Lone Star Cement Co. of Indiana, Inc., Continental Bank Bldg., Indianapolis; 10,000 bbl., to Marquette Mfg. Cement Co., 140 South Dearborn St., Chicago, Ill.; 12,000 bbl., to Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa.; 15,000 bbl., to Southwestern Portland Cement Co., 1719 Industrial Bldg., Los Angeles, Calif.; 33,000 bbl., to Universal Portland Cement Co., 208 South La Salle St., Chicago, Ill.; 33,000 bbl., to Wabash Portland Cement Co., 2091 1st Natl. Bank Bldg., Detroit, Mich., at $1.16 to $1.28 per bbl.

EXPANSION JOINTS — Iowa — State Hy. Comn., Ames, 3,000 pieces 1 x 8 x 9 ft. expansion joints material to Carter-Waters Corp., 215 Old Colony Bldg., Des Moines, $2,922. Noted Nov. 19.

PAINT, etc.—Iowa—State Hy. Comn., Ames, 2,000 gal. red lead paint in 5 gal. cans, to John H. Witte & Sons, Burlington, $4,060; 300 gal. white guard rail paint in 1 gal. cans and 6,700 gal. white guard rail paint in 5 gal. cans, to John Lucas & Co., 1362 West 37th St., Chicago, Ill., $8,330; 2,000 gal. black guard rail paint and 87,600 gal. centerline marking paint in barrels, to International Combustion Tar & Chemical Corp., 2500 South Damen Ave., Chicago, Ill., $15,107; 1,000 gal. orange equipment enamel in 1 gal. cans and 1,000 gal. aluminum paint in 5 gal. cans, to Sherwin-Williams Co., 2001 West Pershing Rd., Chicago, Ill., $3,030. Grand total $30,527.

BRIDGE LUMBER, etc.—Audubon, Ia.—Bd. Supervs. Audubon Co., C. Shingledecker, aud., 5,320 ft. creosoted yellow pine piling, 25,000 ft. creosoted yellow pine bridge lumber, 160,000 ft. Douglas fir bridge lumber, to M. R. Field, Des Moines, $9,278; 2,900 ft. corrugated culvert pipe, to Wheeling Corrugating Co., 100 Southwest 2nd St., Des Moines, $3,925; miscellaneous hardware and paint, to G. N. Corl Hardware Co., Exira, $314. Grand total $13,517. Noted Nov. 19.

LUMBER, etc.—Sigourney, Ia.—Keokuk Co., bridge lumber, piling, to Wallace Lumber Co., $10,046; culvert pipe, to Iowa Culvert Pipe Co., Des Moines, $6,073. Noted Nov. 26.

CEMENT—Brooklyn, N. Y.—H. Hesterberg, pres., Brooklyn Boro, Boro Hall, 200,000 gal. cement, to Standard Oil Co. of New York, 26 Bway., New York, $5,880. Noted Nov. 19.

SEWER BRICK, etc.—Providence, R. I.—City, City Clerk, sewer brick to Barrington Steam Brick Co., 304 Grosvenor Bldg., $12,125; commercial brick, to James C. Goff Co., Reservoir Ave., $21,750; sewer pipe, to Lakewood Hay, Grain & Coal, Lakewood, $18,987. Grand total $52,862. Noted Dec. 3.

CEMENT—Milwaukee, Wis.—Central Bd. Purchase, 20,000 bags portland cement, to Schneider Fuel & Supply Co., 3438 West Forest Home Ave., at $1.55 per bbl., $0.40 allowance for bags, $0.06 discount. Noted Nov. 18 Daily.

PIPE—Brigham, B. C.—Richmond Municipality, 26,400 ft. 12 in. Stuart and Lloyd's lap-welded long sleeve inserted pipe joint, to Evans, Coleman & Evans, Ltd., foot of Columbia St., Vancouver, $48,543.

EQUIPMENT

PROPOSED WORK

TRUCK—Berkeley, Calif.—City purchasing 1½ ton motor truck. F. E. Turner, city clk.

CRANK CASE OIL APPARATUS—Oakland, Calif.—City, W. W. Chappell, city clk., purchasing apparatus to reclaim crank case oil.

TRACTOR and GRADER—Sierra Madre, Calif.—City purchasing 25 hp. caterpillar tractor, 8 ft. blade caterpillar grader. E. A. Green, city clk.

COPPER TUBING—Paterson, N. J.—Passaic Valley Water Comn., 158 Ellison St., one years' supply copper tubing. **Maturity soon.** Fuller & Everett, 252 West 43rd St., New York, engrs.

METAL COOLING TOWER—Brooklyn, N. Y.—Standard Oil Co., F. S. Shepard, supt., plans by H. L. Russell, 83 Stebbins Ave., Bronxville, 13 x 125 ft. metal cooling tower, Kirkland and Norman Aves. To exceed $15,000.

SWITCHBOARD — Two Rivers, Wis. — City, E. J. Connelly, mgr., soon take bids 5 panel switchboard and generator.

BIDS ASKED

SHOVEL—Lynn, Mass.—F. Larson, 295 Parkland Ave., in market gasoline excavating shovel.

CLAMSHELL BOOM—Malden, Mass.—McDonough Co., Broadway, in market 50 ft. clam shell boom for 75 ft. Loraine shovel.

TRUCK—Minneapolis, Minn.—Dec. 28, by F. S. Gram, city purch. agt., chassis for 2-ton truck. N. W. Elsberg, city engr.

GRADER—Las Vegas, Nev.—Jan. 5, by Comrs. Clark Co., 1 motor road grader; 4 or 6 cylinder tractor type motor, solid rubber rear wheels, and 6 in. pneumatic front tires, dual drive, or rubber track front type scarifier with 12 ft. blade.

CONTRACTS AWARDED

ROLLING DOORS—San Francisco, Calif.—State Bd. Harbor Comrs., Ferry Bldg., steel rolling doors for Pier 23, to Rolph Mills Co., 525 Market St., $14,199. Noted Oct. 1.

WATER TANKS—Santa Ana, Calif.—Orange Co., 2 hemispherical bottom water tanks, one at county hospital, other at Westminster, to Pittsburgh-Des Moines Steel Co., 438 South 3rd St., Los Angeles, $5,495 and $4,990 respectively.

FOREIGN

Chili, Santiago—State Dpt. Finance, plans oil refinery, here or other location. Proposes government owned refinery or granting of concession with government interest.

Mexico, Monterrey — Impulsora Popo Chico, San Antonio, Tex., and Monterrey, 2 story, reinforced con., tile, stucco hotel, 5 mi. from here, to Anahuac Constr. Co., Monterrey, $400,000.

U. S. S. R., Leningrad—Soviet Russia c/o Amtorg Trading Corp., 261 5th Ave., New York, plans 100,000 ton grain elevator, incl. deep water piers and rail sidings.

Commercial Buildings

RESIDENTIAL

BIDS ASKED

Calif., San Francisco — See "Contracts Awarded."

N. J., Hasbrouck Heights—See "Contracts Awarded."

N. J., Jersey City—See "Contracts Awarded."

N. J., Passaic—Dec. 29, by Presikel & Skyarla, archts., 629 Main Ave., general contract 3 story, basement, 60 x 115 ft., brick, steel apartment, store, garage, Main Ave. and Westervelt Pl., for J. Maizko, 283 Main Ave., $150,000.

N. J., Springfield—J. B. Beatty, archt., 15 North Reid St., Elizabeth, bids about Jan. 15, general contract 2 story, basement, brick, steel apartment, store, 272-4 Morris Ave., for M. Dandrea, Springfield. $150,000.

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., Flushing—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., San Francisco — L. F. Stoff, 3255 Broderick St., 4 story, basement, reinforced con., Pacific Ave., day labor and segregated contracts. $165,000.

N. J., Hasbrouck Heights—Woodbridge Builders, Inc., North Ave. and 2nd St., Woodbridge, 3 story, basement, brick, steel, Michigan Ave., separate contracts. $150,000. J. T. Camlet, 26 Piaget Ave., Clifton, archt.

N. J., Jersey City—C. Lerner, 3010 Hudson Blvd., 3 story, basement, brick, steel, Harrison Ave., separate contracts. $150,000. M. Kraut, 3010 Hudson Blvd., archt.

N. Y., Brooklyn—A. J. and A. N. Desposito Constr. Corp., 1430 East 17th St., apartment, private garages, Surf Ave. and Beach 38th St., separate contracts. $150,000. Seglig & Finkelstein, 153 Pierrepont St., archts.

N. Y., Brooklyn—A. Rosenblum, 368 East 54th St., apartment, East 91st St. and Avenue A, separate contracts, $150,000. I. Kirshenblit, 1125 Eastern Parkway, archt.

N. Y., Brooklyn—Renault Constr. Corp., 1316 84th St., 6 story, 90 x 90 ft., Ridge Blvd. and Marine Ave., separate contracts. $150,000. M. W. Del Gaudio, 545 5th Ave., New York, archt.

N. Y., Flushing—Brighton Realty Corp., 26 Court St., Brooklyn, apartment, 167th St. and Depot Rd., separate contracts. $150,000. J. J. Millman, 67 Court St., Brooklyn, archt.

CLUBS

PROPOSED WORK

Conn., Waterbury—Waterbury Boys Club, Cottage Pl., plans by W. E. Hunt, 182 Church St., Torrington, 4 story, basement, brick club addition, Cottage Pl. $150,000. **Maturity 1932.**

N. J., Bayonne—B. P. O. E., Bayonne Lodge, 39 West 34th St., altering and constructing 2 story, basement, brick, steel addition, 34th St. near Avenue C. $250,000. **Maturity in February.** Architect not appointed. Former plans abandoned. Noted Oct. 1.

N. J., Newark—Italian Catholic Union Holding Co., J. Soriano, in charge, 118 7th Ave., rescinded general contract 2 story, basement, brick, steel club house, Summer Ave. and D'Auria St. $150,000. J. Centanni, 142 Market St., archt. **Maturity indefinite.** Noted Aug. 20, under "Contracts Awarded."

Okla., Wewoka—Knights of Pythias, 113½ South Main St., Tulsa, sketches by F. A. Duggan, Atco Bldg., Tulsa, 3 story, basement, reinforced con., brick lodge, plain found. $150,000.

Tex., San Antonio—Y. M. C. A., 347 Madison Ave., New York, 4 story Army Y. M. C. A. building on present site of old building. $200,000.

BIDS ASKED

N. J., Asbury Park—W. F. Kesselman, archt., 9th Ave., Belmar, bids about Jan. 22, general contract 2 story, basement, 50 x 110 ft., brick, steel club, for Monmouth Lodge 122, Pride of Asbury Temple 64, I. B. P. O. E. of World. $150,000. Noted Dec. 10.

HOSPITALS

PROPOSED WORK

N. J., Orange—New Jersey Orthopaedic Hospital and Dispensary, T. McCurdy March, pres., 179-81 Lincoln Ave., bids early in spring, 4 story, basement, brick, steel hospital addition, $150,000. York & Sawyer, 100 East 42nd St., New York, archts. Noted Nov. 26.

N. J., Plainfield—Muhlenberg Hospital, Park Ave., 2 story, basement, brick, steel addition, Park Ave. $150,000. **Maturity soon.**

N. Y., Brooklyn—Dpt. Hospitals, Municipal Bldg., New York, sketches by J. E. Kleist, associates, 25 West 45th St., New York, 6 story, 40 x 181 ft. employees dormitory, Kings County Hospital, Winthrop St. and Kingston Ave. $350,000.

N. Y., Neponsit—Dpt. Hospitals, J. G. Greeff, comr. Municipal Bldg., New York, rejected bids Dec. 8, male dormitory, power plant, laundry, altering main buildings, Neponsit Hospital. M. Bernstein, 2 Columbus Circle, New York, archt. Noted Nov. 26.

N. Y., New York—Dpt. Hospitals, Municipal Bldg., cancer hospital, East 30th St. and 1st Ave. To exceed $1,000,000. Bd. Estimate approved site.

N. Y., New York—St. Francis Home for Aged & Incurables, 578 Madison Ave., home, hospital. $1,000,000. Campaign for funds in progress. Site not selected.

BIDS ASKED

N. Y., West Haverstraw—Jan. 7, by Dpt. Health, State Office Bldg., Albany, completing 2 ward buildings at New York State Reconstruction Home; adv. E. N.-R. Dec. 24.

N. Y., Wingdale—Dec. 30, by Dpt. Mental Hygiene, State Office Bldg., Albany, farm buildings, Harlem Valley State Hospital; adv. E. N.-R. Dec. 24.

CONTRACTS AWARDED

N. J., Newark—Bd. City Comrs., City Hall, general contract 2 story, basement, 35 x 110 ft. ward and recreation building addition at Ivy Hill Alms House, to E. M. Waldron, Inc., 40 Park Pl. Est. $200,000. Former contract rescinded. Noted Oct. 29, under "Contracts Awarded."

O., Lima—City, Hospital Comn., brick, reinforced con. nurses' home and hospital, plain founds., to C. H. Shook, Inc., 3rd Natl. Bldg., Dayton, $230,000 and $35,000 respectively. Noted Nov. 12.

R. I., Pawtucket—Memorial Hospital, Prospect St., brick, steel nurses' home, to Central Eng. & Constr. Co., 210 Main St. Est. $150,000. Noted Nov. 5.

CHURCHES

PROPOSED WORK

N. J., Irvington (br. Newark) — Methodist Episcopal Church, R. L. Luerich, pastor, 64 Myrtle Ave., sketches by N. Hulme, 1524 Chestnut St., Phila., Pa., 2 story, basement, brick, steel church. $150,000. **Maturity in April.** Noted Apr. 23.

N. J., Plainfield — Crescent Avenue Presbyterian Church, J. J. Moment, pastor, 815 Park Ave., sketches rebuilding 2 story, basement, brick, stone, East 7th St., Crescent and Watchung Aves. $150,000. Noted Nov. 26.

B. C., Vancouver— Jesuit Fathers of Upper Canada, c/o Provincial of Order, W. H. Hingston, pastor, 160 Wellesley Crescent, Toronto, Ont., purchased 36.39 acre tract in University subdivision and plans developing same for church, cottage and hospital group. $500,000. Architect and engineer not appointed.

BIDS ASKED

Ala., Montgomery—Jan. 12, by Court Street Methodist Episcopal Church South, A. C. Davis, chn., building com., 201 Montgomery St., 2 story, 80 x 215 ft., and 2 story, 46 x 138 ft. Gothic type, concrete, steel, stone, U-shaped church and Sunday school, Ridge and Park Aves. $350,000. G. Awsumb, Dermon Bldg., Memphis, Tenn., archt. Noted Dec. 17.

CONTRACTS AWARDED

N. J., Orange—Our Lady of Mount Carmel, Roman Catholic Church, A. Rasi, pastor, 103 South Centre St., bids about Dec. 31, general contract 1 story, basement, brick, steel church, Hurbert and Centre Sts. $150,000. DePace & Juster, 151 West 46th St., archts. Knopt & Stern, 17 West 44th St., New York, engrs. Noted Nov. 19.

Pa., Allentown—Jacoby & Everett, archts., Commonwealth Bldg., 98 x 119 ft., reinforced con., brick, steel, stone church, concrete found., to F. Yeagel, 711½ North 12th St., Allentown, for Siebert Congregation. $110,000. Noted Dec. 17.

SCHOOLS

PROPOSED WORK

Calif., Los Angeles—Bd. Educ., plans by Lindsay & Eden, 609 Union Insurance Bldg., 2 story, brick, stone addition to John Marshall High School, Tracy and St. George Sts. $150,000. D. S. Reynolds, 756 South Bway., heating engr. Noted Nov. 12.

Calif., Pasadena—California Institute of Technology, 1201 East California St., rejected bids Nov. 20, chemistry and biology buildings, 1201 East California St. Will revise plans. $300,000 each. B. G. Goodhue Associates, and Mayers, Murray & Phillips, 2 West 47th St., New York, archts. Noted Nov. 12.

Calif., Santa Barbara — State Dpt. P. Wks., Sacramento, will ask new bids on revised plans 3 story, reinforced con. science building for State Teachers College. $156,000. Noted Nov. 5, under "Public."

Conn., Norwich—Norwich Free Academy, S. G. Palmer, pres., plans by Chandler & Palmer, Thayer Bldg., 2 story, basement, 75 x 240 ft. brick, steel commercial high school, Crescent Ave. $250,000. Noted Oct. 22.

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Schools (Continued)

Ill., Chicago — University of Chicago, 122 South Michigan Ave., L. P. Speers, bus. mgr., sketches 4 story, basement, 155 x 353 ft., rein.-con., brick, stone women's dormitory, near University Ave.

Ill., Hammond—Bd. Educ., plans by J. T. Hutton & Son, Hammond. Thomas A. Edison School, brick, Bedford stone, Jackson, Madison and Mulberry Sts. $350,000.

Ind., Muncie—Ball State Teachers College, L. A. Pittenger, pres., sketches new art recitation building, on campus. $275,000.

Mass., Dorchester—City of Boston, Dpt. School Buildings, enlarging Lucy Stone School, Regina Rd., Ward 17. $150,000 or more. Architect not appointed.

Mass., Dudley—Nichols College of Business Administration rebuilding college buildings. $150,000 or more. Architect not appointed.

Mass., Wellesley—Webber College, G. W. Soleman, pres., Babson Park, college, Brook St. $150,000 or more. Architect not appointed.

Mass., Williamstown—City, F. V. Grant, supt. schools, sketches by Warren S. Holmes Co., 2100 Capitol Bank Tower, altering and constructing 2 story, basement, brick, steel school addition. $125,000-$150,000.

N. J., Caldwell — Bd. Educ., High School, voted down proposal to construct 2 story, basement school, Central Ave. $150,000. C. W. Wands, 309 Bloomfield Ave., archt. Noted Sept. 10.

N. J., Cranford—Bd. Educ., Holly St., sketches by H. B. Brady, 333 North Broad St., Elizabeth, 3 story, basement, brick, steel, rein.-con. high school, Union Ave. $150,000.

N. J., Hampden—Bd. Educ., R. P. Collins, chn., plans by R. W. Foote, Chamber of Commerce Bldg., New Haven, and W. R. McCornack, consult. archt., 10006 Carnegie Ave., Cleveland, O., 3 story high school. $1,000,000.

N. J., Hasbrouck Heights—Bd. Educ., R. Bayer, chn., Special Housing Comn., Franklin School, new sketches by E. I. Williams, 131 West Passaic Ave., Rutherford, 2 story, basement, brick, steel addition to Lincoln Grade School, Ottawa Ave., $150,000; 2 story, basement addition to Euclid School, Passaic Ave., $150,000. Noted Nov. 19 and Dec. 3.

N. J., Jersey City—Bd. Educ., Administration Bldg., plans by J. T. Rowland, Jr., 30 Journal Sq., School 8, 2 story, basement, brick steel, Sherman Ave. $150,000. Noted Sept. 24.

N. J., Piscataway town — Bd. Educ., Raritan Twp., for Piscataway town School, 2 story, basement, brick, steel. $150,000. **Maturity in March.** Former project voted down, and will select new site. Noted Aug. 6.

Pa., Pittsburgh—St. Marys of the Mount, **T.** O'Regan, pastor, in charge, 403 Grandview **Ave.,** plans by Very Rev. Father Michael McInerney (Order St. Benedict), Belmont Abbey, Belmont, N. C., and takes bids in March 2 story, basement, 80 x 100 ft. brick, hollow tile, limestone, concrete, steel parochial grade school, Bigham and Grandview Sts. $150,000.

S. D., Sioux Falls—Bd. Educ., W. Krimball, secy., soon takes bids 4 story, basement, brick, rein.-con., stone school addition. $600,000. Perkins & McWayne, 322 Paulton Bldg., archts.

Wis., Green Bay—St. John's Catholic Congregation, J. Therein, pastor, 413 St. Johns St., rein.-con., brick school. $150,000. Architect not appointed.

BIDS ASKED

Conn., Darien—Dec. 30, by Bd. Educ., E. B. Fuller, supt., Renshaw Rd., 2 story, basement, 95 x 175 ft., brick, steel, rein.-con., plain found., Hoyt St. $150,000. John Noble Pierson & Son, 175 Smith St., Perth Amboy, N. J., archts. Noted Nov. 12.

Conn., Westbrook—Dec. 29, by Town, J. H. Stanners, chn. Building Com., 1 story, 110 x 165 ft., brick school, South Main St. $125,000—$150,000. Langdon & Palmer, 240 State St., New London, archts. Noted Dec. 17.

Conn., Greenwich — Town, Bd. Educ., bids about Jan. 1, general contract brick, steel addition to Byram Hill School, $300,000. Coffin & Coffin, 522 5th Ave., New York, archts. Noted Nov. 19.

Ind., Anderson—Bd. Educ., L. Myers, pres., bids about Apr. 1, school incl. auditorium, on campus. $160,000. E. F. Miller, 24th and Columbus Aves., archt. Noted Sept. 10.

Mass., Cambridge—Jan. 5, by City, School Comn., and R. H. Doane, archt., 60 Batterymarch St., Boston, 5 story, basement, brick, stone, steel, concrete technical high school, concrete found., Broadway, $1,500,000; heating and ventilating, est. exceeds $25,000; plumbing, $25,000 or more; electrical work, $25,000 or more. Noted Oct. 29.

Mass., New Bedford — Mt. Carmel Roman Catholic Parish, A. P. Vieira, pastor, taking bids 2 story, basement, brick, steel school, convent. Rivet and Bonney Sts. $200,000. H. Fallows, 131 Stewart St., Fall River, archt. Noted Nov. 19.

N. J., Bayonne—F. F. Durang, archt., 110 West Dudley Ave., Westfield, bids about Apr. 1, general contract 3 story, rein.-con., brick, steel high school, Avenue C and West 13th St., for St. Mary's Church, W. Lawlor, pastor, 326 Avenue C. $200,000. Noted Dec. 3.

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N. J., East Orange—Bd. Educ., 19 Winan St., bids about Mar. 1, Junior High School, 2 story, basement, brick, steel, North Clinton St. and Renshaw Ave. $350,000. Guilbert & Betelle, 20 Branford Pl., Newark, archts. Noted Sept. 24.

N. J., Hillsdale—Bd. Educ., G. M. Strobsahl, dist. clk., bids about Mar. 1, general contract 2 story, basement, brick, steel, rein.-con. addition to Junior High School, Demarest Ave. $150,000. Hacker & Hacker, 201 Main St., Fort Lee, archts. Noted Nov. 5.

N. J., Jersey City—Bd. Educ., H. F. O'Melia, pres., Administration Bldg., bids about Mar. 15, Senior High School, 4 story, basement, brick, steel, $2,000,000. J. T. Rowland, Jr., 30 Journal Sq., archt. Noted Dec. 3.

N. J., New Brunswick—Jan. 4, by Dpt. Institutions & Agencies, State Office Bldg., Trenton and Rutgers University, College Ave., general contract Soil Science Building, 3 story, basement, 70 x 140 ft., brick, steel, at Rutgers University, State Experimental Farm. $150,000. A. Merchant, 1 Elm Row, archt. S. Shaw & Co., 24 Commerce St., Newark, engrs. Noted Sept. 3.

N. J., Raritan—Bd. Educ., bids about Feb. 1, general contract 2 story, basement, rein.-con., brick, steel high school. $150,000. Noted Nov. 26.

N. J., West New York—Bd. Educ., L. Roth, pres., Municipal Bldg., bids about Feb. 15, altering and constructing 2 story, basement, 60 x 100 ft., rein.-con., brick, steel addition to School 3, 11th and Polk Sts. $200,000. F. J. Ricker, 685 Hudson Ave., archt. Noted Sept. 10.

N. Y., Corona—Dec. 29, by W. C. Martin, archt. and Supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, general contract P. S. 19, 98th 99th Sts., 41st and Roosevelt Aves., for Bd. Educ., 500 Park Ave., New York. Noted May 22, 1930.

N. Y., Flushing Heights—Dec. 29, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, general contract P. S. 163, 59th Ave. from 159th and 160th Sts., for Bd. Educ., 500 Park Ave., New York. Noted Dec. 10.

N. Y., New Paltz—Dec. 29, by Commissioner Dpt. Educ., Education Bldg., Albany, completing Practice School at New York State Normal School. Noted Nov. 26.

N. Y., St. George — Staten Island Academy, H. O'Connell, pres. Bd. Trustees, 70 Stuyvesant Pl., bids in April or later, 2 story, basement, brick, steel school, Ocean View Terrace and Todt Hill Rd. $150,000. **Maturity in spring.** Delano & Aldrich, 126 East 38th St., New York, archts. Noted May 7.

N. Y., Syracuse—Dec. 29, by Commission Educ., Education Bldg., Albany, laboratory building for College of Forestry, Syracuse University; adv. E.N.-R. Dec. 24.

Utah, Helper—School Bd. Carbon Co., Price, high school. $200,000. Architect not appointed.

CONTRACTS AWARDED

Mass., Brookline—Town, E. R. Coverly, supt. schools, 2 and 3 story, basement, irregular sized, brick, steel high school addition, plain found., Greenough St. and Lowell Rd., to E. J. Rappoli, 515 Mass Ave., Cambridge, $280,577. Noted Dec. 3.

Neb., Lincoln—University of Nebraska, State Bd. Regents, L. F. Seaton, operating supt., 3 story, basement, 101 x 159 ft. dormitory, to E. Rokahr & Sons, 856 Stuart Bldg., $146,847. Noted Nov. 26.

Wis., Milwaukee—Bd. School Directors, roofing for Steuben Junior High School, to M. M. Schranz Roofing Co., 2450 West Cornell St., $13,129. Noted Nov. 26.

Wis., Milwaukee—Bd. School Dist., mason work for Solomon Juneau High School, to J. Lorenz, 1626 West Vliet St., $122,896. Noted Nov. 5.

THEATRES

PROPOSED WORK

California—Owner, c/o S. C. Lee, archt., 2404 West 7th St., Los Angeles, sketches 50 concrete theatres, 300 seating capacity each, in various cities. $50,000 each.

BIDS ASKED

Calif, Berkeley—Walker & Eisen, and C. A. Balch, archts., Western Pacific Bldg., Los Angeles, taking bids 2 story, rein.-con., steel theatre, store, Shattuck Ave., for United Artists of California, 166 South Vermont Ave., Los Angeles. $250,000.

OFFICES

PROPOSED WORK

N. Y., Port Jervis—E. A. Downey, archt., Glen Spey, soon awards general contract 2 story, basement, brick, steel office, store, for S. Holden Realty Co., 18 Ball St. $150,000.

BIDS ASKED

N. J., England—R. Livingston, 13 East Palisade Ave., bids about Feb. 15, general contract 5 story, basement, brick, steel, office, store, Palisade Ave. and North Dean St. $150,000. Private plans. Noted Dec. 10.

CONTRACTS AWARDED

N. J., Westfield—Elizabethtown Consolidated Gas Co., 16 West Jersey St., Elizabeth, general contract 1 and 2 story, basement, brick, steel office, stores, to F. Zurgard Constr. Co., 147 Schley St., Newark. Est. $150,000.

STORES

PROPOSED WORK

N. J., East Orange—Baldwin Constr. Co., 614 Central Ave., 2 story, basement, brick, steel store, office, Central Ave. $150,000. **Maturity soon.**

N. Y., New York—Emigrant Savings Bank, 51 Chambers St., sketches by Voorhees, Gmelin & Walker, 101 Park Ave., New York, altering and constructing store and office addition, 14 East 43rd St. $150,000.

BIDS ASKED

N. J., North Bergen—North Bergen Auto & Electric Supply Co., 883 Bergenline Ave., bids about Jan. 15, general contract 2 story, basement, 50 x 125 ft., brick, steel store and dance hall, 879-81 Bergenline Ave. $150,000. F. Huberti, 116 Hauxhurst Ave., Weehawken, archt. Noted Oct. 1.

CONTRACTS AWARDED

Mass., Fitchburg—J. R. Dyer, Hotel Raymond, rebuilding 3 story, basement, brick, stone, steel store, office, Depot Sq., to A. T. Gerouard, Union St. Est. $150,000.

N. J., Upper Montclair—Estate of C. M. Horton, c/o J. Horton, archt., 39 North Fullerton Ave., Montclair, general contract 2 story, basement store, apartment, Valley Rd., to Adams Faber Co., 247 Lorraine Ave. Est. $150,000. Noted Nov. 26.

PUBLIC

PROPOSED WORK

Conn., Rocky Hill—VETERAN'S HOME—State, State Veteran's Home Comn., Hartford, retained C. J. Malmfeldt, consult. archt., 15 Lewis St., Hartford, to conduct competitive plans veteran's home. $250,000. Wynne & Hahn, 902 Chapel St., New Haven, engrs. Injunction Dec. 14 to Jan. 5, prevents purchase of site. Noted Dec. 17.

N. J., Linden—RECREATIONAL—Bd. City Council, City Hall, 2 story, basement, brick, steel recreational building, Wood Ave. $150,000 **Maturity about January.** Architect not appointed.

N. J. Rahway—ATTENDANTS—Dpt. Institutions & Agencies, State Office Bldg., Trenton, rejected bids Nov. 24, 3 story, basement, brick, steel, at New Jersey Reformatory. $150,000. Noted Dec. 10, under "Contracts Awarded."

N. Y., Brooklyn—SURROGATES COURT—H. Hesterberg, pres. Brooklyn Boro. Boro Hall, surrogate court building, Boro Hall Sect. To exceed $250,000. No money authorized. **Maturity indefinite.**

Wyo., Casper—COURT HOUSE—Bd. Comrs. Natrona Co., new court house. $150,000. Architect not appointed.

BIDS ASKED

Calif., San Jose—SCIENCE—Jan. 5, by State Dpt. P. Wks., Div. Architecture, Sacramento, 2 story, basement, rein.-con. natural science building. $200,000. R. Wyckoff, Growers Bank Bldg., archt. Noted Aug. 27.

N. Y., Bedford Hills—EMPLOYEES—Jan. 7, by Commissioners Dpt. Correction, State Office Bldg., Albany, completing employees building, laundry building, storehouse, New York State Reformatory for Women; adv. E.N.-R. Dec. 24.

N. Y., New York—JAIL—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., bids about Jan. 15, county jail, Cromwell and River Aves. $1,000,000. H. Freedlander, 681 5th Ave., and M. Hausel, 3307 3rd Ave., archts.

CONTRACTS AWARDED

N. J., New Brunswick—COURT HOUSE—Bd. Freeholders Middlesex Co., County Record Bldg., general contract rebuilding 4 story, basement, brick, steel court house and connecting tunnel, to Rogers & Gons Constr. Co., 74 John St. Est. $150,000. Noted Dec. 3.

N. J., Paterson—MUSEUM—Passaic Co. Park Comn., 45 Church St., general contract altering 2 story, basement, brick, steel Lambert Castle into museum, to Super Constr. Co., 345 Oak St., Passaic; plumbing, roofing, sheet metal work and heating, to G. H. Van Varick, Inc., 28 Hellman St., Clifton; steel, to Selback-Meyer Co., 601 22nd St., West New York; electrical work, to Watson Flagg Eng. Co., 200 Straight St. Est. $150,000. Noted Nov. 25.

N. J., Trenton—ARMORY—Dpt. Institutions & Agencies, State Office Bldg., general contract altering and constructing 2 story, basement, brick, steel infantry armory addition, to W. C. Ehret, 209 Academy St. Est. $150,000. Noted Nov. 19.

N. Y., Attica—CELL HOUSE—Dpt. Correction State Office Bldg., Albany, general contract north cell reception and disciplinary barracks, auditorium and chapel, at Attica State Prison, to Johnson Constr. Co., Inc., 207 West Huron St., Buffalo, $1,392,000; heating, to Freyn Bros. of Michigan, 3850 Michigan Ave., Detroit, Mich., $72,327; sanitary work, to G. H. Brake, Inc., 128 Lexington Ave., Buffalo, $81,000; electrical work, to Westchester Electrical Equip. Co., 73 South Bway., Yonkers, $42,395. Grand total $1,587,722. Noted Nov. 26.

N. Y., Brooklyn—FIRE HOUSES—Fire Dpt., Municipal Bldg., New York, fire houses at (1) Avenue U (2) 29th St. (3) South 2nd St., general contract, to P. M. Sterling, Inc., 230 Park Ave., New York, (1) $52,368 (2) $51,237 (3) $52,318; heating, to Murphy & Beaumont, (1) $2,219 (2) $2,249 (3) $2,249; plumbing, to Triboro Eng. Co., Chatham Phoenix Bank Bldg., Long Island City, (1) $2,872, to Davemor Plumbing & Heating Co., (2) $2,818, to M. Dumey, 105 Schenectady Ave., (3) $2,750. Grand total $171,080.

Public (Continued)

Okla., Pawnee—COURT HOUSE—Pawnee Co., c/o J. M. Perry, clk., 4 story, basement, 78 x 105 ft., rein.-con., brick, plain found., to Manhattan Constr. Co., Court Arcade, Tulsa. $119,800; steam heating, to J. L. Swafford. 19 North Dewey St., Oklahoma City. $16,794; electric wiring, to Griffith Electric Co., 224 West 23rd St., Oklahoma City. $11,698. Grand total $148,292. Noted Dec. 3.

UNCLASSIFIED

PROPOSED WORK

Mass., Chelsea—SOLDIER'S HOME, etc.—Soldier's Home, Crest Ave., plans by Coolidge, Shepley, Bulfinch & Abbott, 1 Court St., Boston, and takes bids early in January, 3 story, basement, 40 x 80 ft. service building and 3 story, basement, 125 x 130 ft., nurses home units, brick, steel, concrete, Hillside Ave. $300,000.

Mo., Kansas City—EXCHANGE—Southwestern Bell Telephone Co., 11th and Pine Sts., St. Louis, bids early in 1932, 2 story (ultimately 4 story), basement, 75 x 119 ft., brick, stone, concrete, terra cotta addition, 39th St. and Montgall Ave. $200,000. I. R. Timlin, 1916 Telephone Bldg., St. Louis, archt.

Mo., St. Louis—HOME—Sisters of Mercy, c/o Mother Ignatius, 23rd and Locust St., sketches by G. D. Barnett, 914 Syndicate Trust Bldg., 17 story, basement, tower, rein.-con., brick, stone, steel business women's residential home, on 213 x 253 ft. site, Lindell Blvd. and Sarah St.

N. J., Atlantic City—RAILROAD TERMINAL—Reading Railroad Co., Terminal, Atlantic City, revised sketches 3 story, basement, brick, steel, Artic Ave. between Missouri nad Arkansas Aves. $4,500,000. Plans presented to State Public Utility Comn. for approval. Noted Feb. 5.

O., Cleveland — POST OFFICE SUBSTRUCTURE—Cleveland Union Terminals Co., Terminal Tower, preparing plans deep caisson work and rein.-con. found., for new post office, West 6th St. and Prospect Ave. $300,000. H. D. Jouett, Terminal Tower, ch. engr.

Pa., Pittsburgh—HOME for AGED—Jewish Home for Aged, I. A. Simon, in charge Building Com., Farmers Bank Bldg., revised plans by Marks & Kann, 701 Home Trust Bldg., and takes bids in January, 4 story, basement, 108 x 176 ft., brick, limestone, concrete slab reinforcing, incl. synagogue, near Homestead Bridge. $250,000. Noted Aug. 14.

BIDS ASKED

Calif., San Francisco—WAR MEMORIAL and OPERA HOUSE—Jan. 5, by War Memorial Com., hollow tile; Jan. 19, stage equipment; Jan. 26, chairs for opera house and war memorial, for City and San Francisco Co. Noted Oct. 1.

N. J., Asbury Park — DANCE HALL — See "Contracts Awarded."

N. B., St. John—PASSENGER STATION—Jan. 5, by W. C. Appleton, Moncton, genl. mgr. (Atlantic Region) Canadian Natl. Rys., C. S. Gzowski, ch. engr. constr., Montreal, Que., for Contr. 4, passenger station.

CONTRACTS AWARDED

Calif., San Diego—MUSEUM—San Diego Society of Natural History, Balboa Park (1st unit), 2 story, 60 x 220 ft., rein.-con., to Jarboe Constr. Co., Spreckles Bldg. Est. $137,000. Total est. $1,000,000. Noted Aug. 20.

N. J., Asbury Park—DANCE HALL—R. DuPreer, 1920 Corlies Ave., Neptune City, 2 story, basement, brick, steel dance hall, pool parlor, Spring St., separate contracts. $150,000. E. Worth, 207 Market St., Newark, archt. Noted Dec. 3.

N. B., St. John—PASSENGER STATION—Canadian Natl. Ry., C. S. Gzowski, ch. engr. constr., Montreal, Que., erecting fabricated steelwork, to St. John Dry Dock & Shipbuilding Co. Ltd. Noted Jan. 8.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Ariz., Phoenix—PLANT—United Copper Mining & Paint Co., Ltd., c/o F. Beutel, pres., 936 East 60th St., Los Angeles, Calif., copper paint plant. $50,000.

Calif., Ione—CREAMERY and DAIRY BARN—State Dpt. P. Wks., c/o Div. Architecture, Sacramento, rejected bids Nov. 24, creamery and dairy barn for Preston School of Industry. Will revise plans and new bids asked. Noted Nov. 12.

Calif., Sacramento — BOTTLING PLANT — Coca Cola Co., 3216 Sacramento Blvd., plans by C. Dean, California State Life Bldg., 2 story, 75 x 120 ft., brick, Miller Way. $40,000.

Ill., La Salle—CEMENT PLANT—Marquette Cement Co., plant. To exceed $40,000. **Maturity indefinite.**

Mo., Cape Girardeau — CEMENT PLANT — Marquette Cement Co., altering and constructing addition to cement plant, incl. new type coolers.

Mo., St. Louis—BAKERY—J. Hahn Realty Co., 2801 South 7th St., 1 story, 24 x 139 ft., rein.-con., brick addition, 2809 South 7th St., to F. Schroeder, 3860 Arsenal Bldg. Hauck Bakery Co., 2809 South 7th St., lessee.

N. J., Carlstadt—FACTORY—J. T. Camlet, archt., 26 Piaget Ave., Clifton, soon lets general contract 2 story, basement, brick, steel, 14th St., for Plastic Art Marble Co., 321 11th St. $40,000.

N. J., Jersey City—FACTORY—Jersey City Welding & Machine Wks., 394 Grand St., 2 story factory. To exceed $40,000.

N. J., Newark—REFINERY—A. Peter, archt., 207 Market St., Newark, soon lets general contract brick, steel refinery, for Owner, c/o architect. $40,000.

N. J., Roselle—DRESS FACTORY—J. Anderson, archt., 251 North Broad St., Elizabeth, soon takes bids 2 story, basement, 80 x 100 ft., brick, steel, Chandler Ave., for Roselle Frocks, Inc., 1107 Chandler Ave. Est. $40,000.

N. Y., Brooklyn—LAUNDRY—General Linen Supply Co., 835 Myrtle Ave., sketches by M. Marlo, 200 Beverley Rd., 4 story, Stockton St. and Marcy Ave. $175,000.

N. Y., Dansville—GAS PLANT—New York State Gas & Electric Corp., Central Ave., Ithaca, gas plant. Pub. Serv. Comn. authorized construction.

N. Y., Freeville—GAS PLANT—New York State Electric & Gas Corp., Central Ave., Ithaca, applied to Pub. Serv. Comn., for permission to construct gas plant and distribution system.

N. Y., Highlands—GAS PLANT—Central Hudson Gas & Electric Corp., South Rd., Poughkeepsie, gas plant and distribution system.

N. Y., Spofford—GAS PLANT—Empire Gas & Electric Co., Geneva, c/o New York Central Electric Corp., East St., Rochester, gas plant and distribution system.

Ont., Toronto—PLANT—Planet Mfg. Co. Ltd., C. Havelock, pres., Taylor, plant. $50,000.

BIDS ASKED

Mass., Boston — MANUFACTURING — See "Contracts Awarded."

Va., Martinsville—FLASHLIGHT PLANT—See "Contracts Awarded."

Wis., Appleton—PRINTING PLANT—LeVee & Gmeiner, archts., 601 West College Ave., taking bids 2 story, 92 x 160 ft., rein.-con., brick, rein.-con., for Badger Printing Co., Appleton. $40,000. Noted Dec. 17.

B. C., New Westminster—PACKING PLANT—Swift Canadian Co. Ltd., 17 Water St., Vancouver, taking bids packing plant additions, incl. 40 x 60 ft. boiler house, hog fuel shed, refinery building, new smokestack. $60,000 incl. equipment.

CONTRACTS AWARDED

Calif., Stockton—METER SHOP—Pacific Gas & Electric Co., 245 Market St., San Francisco, 1 story, brick, steel, to E. H. Riley, 1st Natl. Bank Bldg., $45,000. Noted Dec. 3.

Mass., Boston—MANUFACTURING—Skinner Organ Co., 445 Little Bldg., and Aeolian Co., 5th Ave. and 54th St., New York, altering organ and piano manufacturing plant, incl. equipment for piano manufacturing, day labor and separate contracts. To exceed $40,000.

N. Y., Beacon—LAUNDRY, etc.—Comr. Correction, State Office Bldg., Albany, laundry and tailor shop, building, staff house, at Matteawan State Hospital, to Miller & Gaynor, 1 Clinton Sq., Poughkeepsie, $208,300; heating, to Dierks Heating Co., 210 East 31st St., New York, $26,645; sanitary work, to C. H. Darmstadt, Inc., 352 West 43rd St., New York, $16,310; electrical work, to Enzert-Hellman, Grand Central Terminal, New York, $12,450. Grand total $263,705. Noted Nov. 19.

N. C., Huntersville—TEXTILE MILL—Anchor Mills, altering and re-equipping textile mill, to Walker Engineering Co., 517 Harull Ave., Gastonia. Est. $40,000.

S. C., City View—BLEACHERY, etc.—Southern Wearing Co., City View, 40 x 60 ft. bleachery and dye house, to Gallivan Building Corp., Greenville.

Va., Martinsville—FLASHLIGHT PLANT—Collins Flashlight Corp., C. B. Collins, pres. (1st. unit), Collinsville Community, incl. 1 story, brick, concrete plant to manufacture no-battery flashlights, work to be done by corporation, H. H. Dudley, in charge, also started work on grading streets and erecting employees' dwellings. To exceed $75,000.

GARAGES

PROPOSED WORK

Calif., Long Beach—City Council revised plans by Dedrick & Bobbe, archts. and engrs., 901 Heartwell Bldg., 3 story, basement, 60 x 120 ft., rein.-con., terrazzo, ornamental iron, public utility building, Bway. and Pacific Ave. Basement under entire building will probably be used for garage and will probably be built by force account. $100,000. Bids will be taken for remainder of construction. Noted July 30.

Calif., Santa Ana—M. Medlock, 820 North Main St., plans by F. Lansdowne, 514½ North Main St., and G. D. Riddle, 201 Pacific Southwest Bldg., Long Beach, 1 story, 115 x 121 ft., brick, stucco, tile, cast stone, terrazzo, concrete, steel, ornamental iron garage and sales room, 806 North Main St. $40,000.

N. J., East Orange — Owner, c/o K. W. Dalzell, archt., 263 Central Ave., sketches 2 story, basement, brick, steel garage, showrooms. $150,000.

N. J., Jersey City—H. Adelman, archt., 437 Bway., Bayonne, bids about Jan. 22, general contract 1 story, basement, brick, steel garage, bus terminal, Gates Ave. and Merritt St., for Lafayette Greenville Bus Owners Assn., Greenville Bus Co., 77 Seaview Ave. $150,000. Noted Dec. 17.

N. Y., Brooklyn—Realty Associates, Inc., F. Fox, pres., 162 Remsen St., sketches by B. Driesler, Jr., 153 Remsen St., altering 3 story service garage, gas station, Calm St. $100,000.

N. Y., Jamaica—J. A. C. Realty Corp., 16 Court St., Brooklyn, sketches by C. Goodman 375 Fulton St., Brooklyn, service garage. $40,000.

BIDS ASKED

Mass., Waltham—Woodward & Tyler, 844 Main St., taking bids 1 story, brick, steel service station, plain found., Main and Bank Sts. $50,000. Private plans. Noted Dec. 17.

N. J., Newark—See "Contracts Awarded."

CONTRACTS AWARDED

N. J., Newark — Stanislaus Puvonski, 228 Keer Ave., 1 story, basement, brick, steel auto laundry, plant, store, 32-34 Jones St., separate contracts. $40,000. Private plans.

POWER PLANTS

PROPOSED WORK

Calif., Seal Beach—Los Angeles Gas & Electric Co., 810 South Flower St., sketches power plant addition. $3,500,000. Eng. Dpt. of Owner, engrs. Noted Oct. 15.

Ill., La Salle—City, hy. E. Byrne, clk., 1 story, 88 x 89 ft., municipal light plant, incl. two 500 hp. boilers, two 2,000,000 kw. condensers, super-heaters, turbines, crane, $55,000. Burns & McDonnell Eng. Co., Interstate Bldg., Kansas City, Mo., engrs. Noted Nov. 5.

Ind., Brazil—City Council, light plant, $150,000. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

N. Y., Sodus — Lake Ontario Power Corp., Sodus, sketches electrical plant and extensions. To exceed $40,000.

N. Y., Woodhull—New York Central Electric Corp., East St., Rochester, electric plant and distribution system, Steuben Co.

BIDS ASKED

Ia., Bellevue—See "Contracts Awarded."

CONTRACTS AWARDED

Ill., Chicago—Education Hospital, 1820 West Taylor St., masonry contract concrete, brick power plant and lines, to Schmidt Bros. Constr. Co., 22 East Huron St. Est. $50,000.

Ia., Bellevue—City Council, L. J. Gaylor, clk., two 300 hp. diesel engines direct connected to 200 kva. generators, to Chicago Pneumatic Tool Co., 3655 Iron St., Chicago, $42,000; 40 x 60 x 20 ft. brick veneer, power plant, by day labor. Est. $60,000.

Ia., Mason City—Jacob Decker & Sons Packing Co., power plant addition, incl. equipment, to Fegles Constr. Co., 711 Wesley Temple Bldg., Minneapolis, Minn. Est. $375,000. Noted Dec. 17.

Pennsylvania—See "Railways."

WAREHOUSES

PROPOSED WORK

Mass., Salem—Mexican Petroleum Corp., J. D. Bartlett, 182 Crown St., New Haven, oil terminal and distribution plant, Ocean Ave. and Broadway. To exceed $40,000. Private plans.

N. Y., Brooklyn—E. L. Phillips Constr. Co., 50 Church St., New York, bids late in January on separate contracts warehouse and railroad siding, New Utrecht Ave. and 62nd St., for Kings County Lighting Co., 6740 4th Ave. Est. $75,000.

N. Y., Jamaica—H. Hurwitz & Sons, 9225 160th St., bids late in January, general contract 3 story storage, 160th St. and Jamaica Ave. To exceed $40,000. J. Fein, 1773 Pitkin Ave., archt. Noted Dec. 10.

N. Y., New York—Romike Realty Corp., J. L. Weil, pres., 507 West 125th St., will award contract in January, from estimate submitted storage and manufacturing plant, 1340 Amsterdam Ave. $40,000. Jardine, Murdock & Wright, 347 Madison Ave., archts. $40,000. Weil Bros. Hardware & Plumbing Co., 507 West 125th St., lessee. Noted Dec. 17.

Utah, Salt Lake City—E. S. Clark & G. R. Battle, Salt Lake City, plans by Pope & Burton, Newhouse Bldg., 1 story market. $40,000.

BIDS ASKED

Calif., Long Beach—Long Beach Market Ltd., 545 East Bway., aggregated bids about Dec. 21, 1 story, mezzanine, basement, 60 ft. tower, 180 x 316 ft., market building, Bway. between Linden and Atlantic Aves. $40,000. Excavation contract awarded, to Macco Constr. Co., 815 North Ocean St., Clearwater. C. F. Whittlesey, 1616 South Vermont Ave., Los Angeles, engr. Noted Aug. 27, under "Unclassified Buildings."

CONTRACTS AWARDED

Calif., Los Angeles—J. A. Lynch, 906 Citrus St., 1 and part 2 story, 200 x 310 ft., brick structural steel, steel sash, warehouse, 800 East 62nd St., to Lynch Constr. Co., 730 East Gage St. Est. $50,000.

N. Y., Buffalo—Westinghouse Electric & Mfg. Co., Ellicott Sq., general contract 1 and 2 story, 112 x 362 ft., steel, brick warehouse, Seneca St. between Morris and Orlando Sts., to J. W. Cowper Co., Rand Bldg., $160,000.

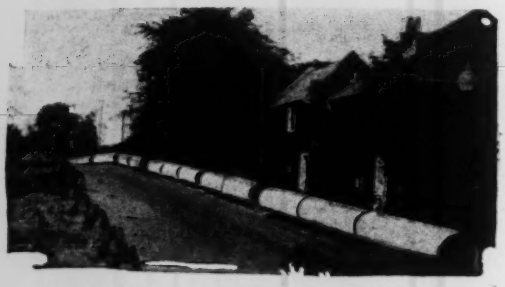
N. Y., New York—Railway Express Agency, 219 East 42nd St., 2 story express office, distribution building, to Miller Blyth, 441 Lexington Ave. Est. $63,000. Noted Dec. 10.

See proposal advertising on page 43

Constr. News page 233

THE BONNA PIPE

The Original Steel Core Reinforced Concrete High Pressure Mains



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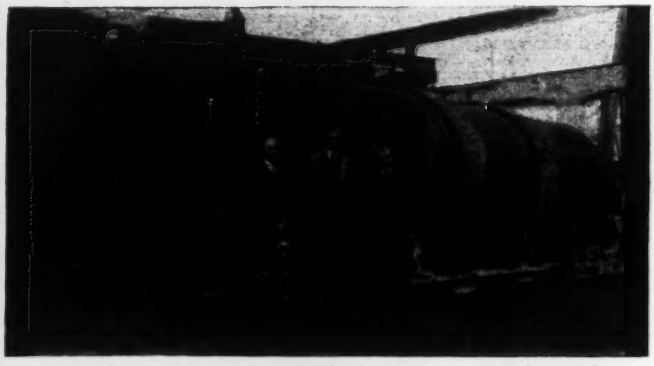

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